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JANUARY 1943

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MAGAZINE



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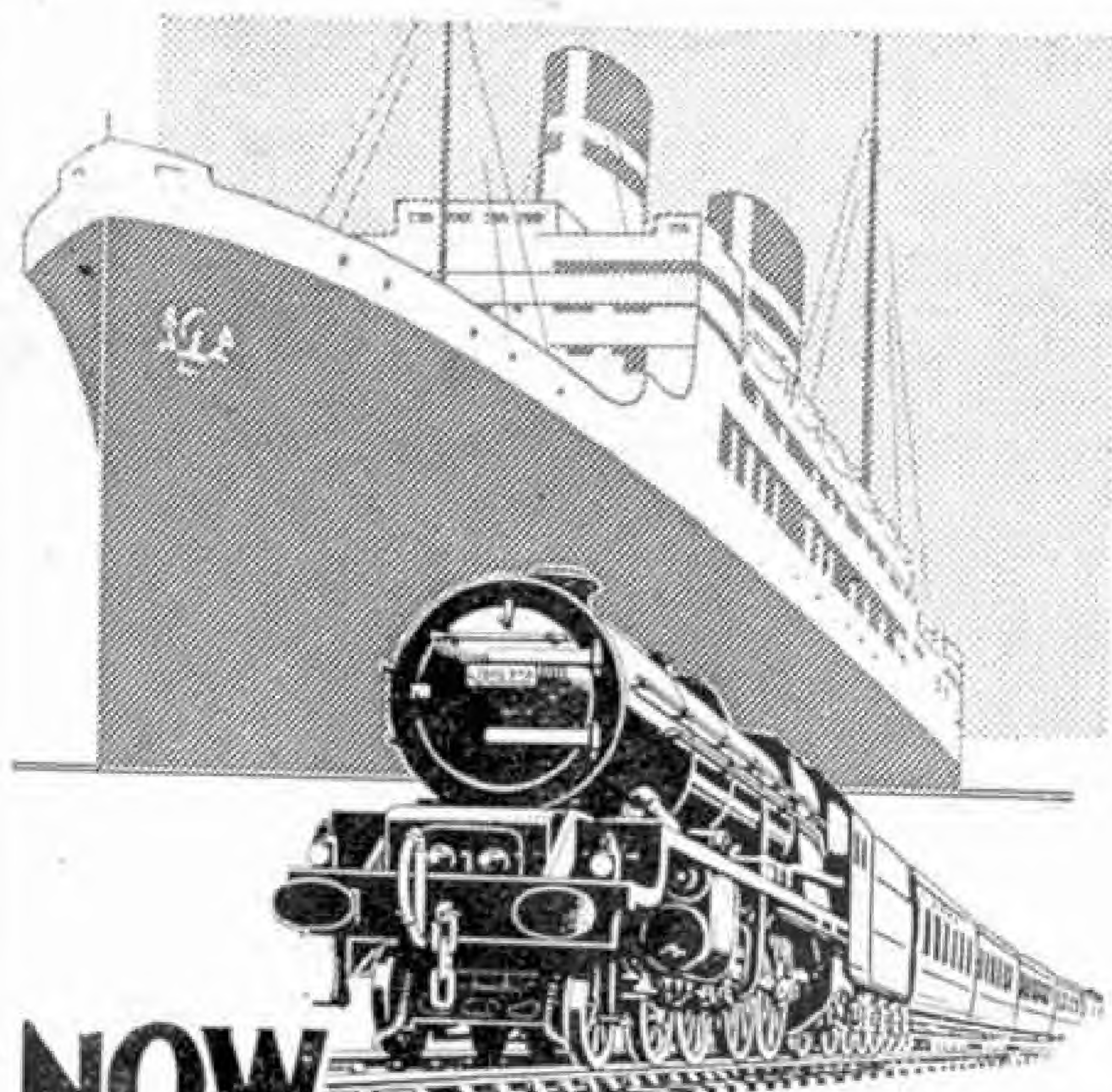
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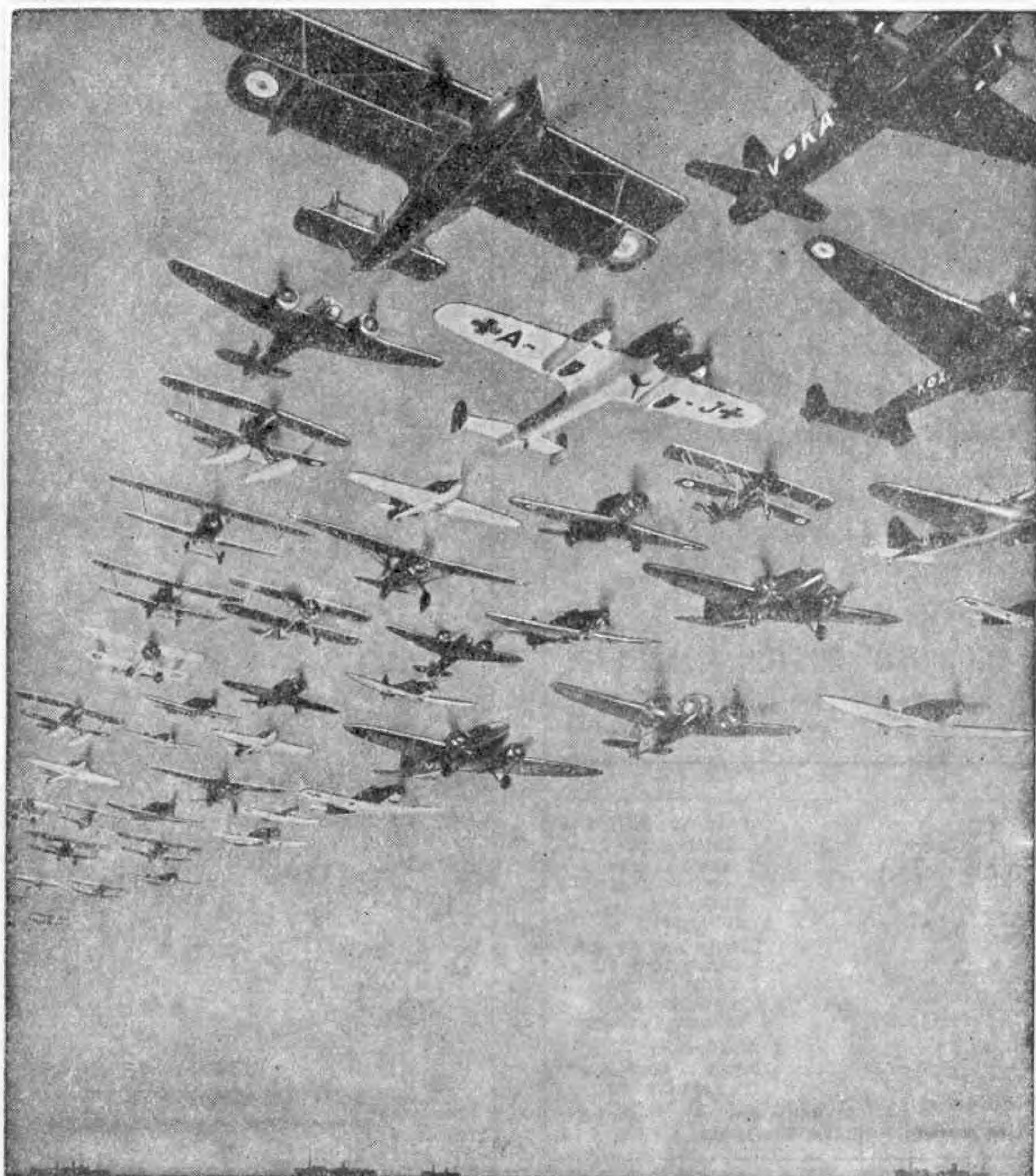
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MAGAZINE

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January 1943

With the Editor

"Well Worth Watching"

Here we are at the beginning of another year of war, but with a much brighter outlook. At last we are attacking the enemy on every front, and our steadily growing strength gives us confidence in the outcome. The skill of our engineers, and the splendid work of the vast army of men and women in the war factories, have given our fighting men the equipment they have called for so long and so urgently; and never again is it likely that we shall hear the reproach: "Too little and too late." We may yet have setbacks, but I feel there is every reason to hope that the end of this year will bring within sight the end of the war. It will be a year of desperately hard work and of great and stirring events, and the world-wide developments will be, to use the Prime Minister's phrase, "well worth watching."

* * *

I have recently had the opportunity of seeing something of the work of an aircraft repair factory. Next month I hope to give readers as full an account of my visit as can be permitted.

Leaders in the War

Admiral Sir Max K. Horton

Admiral Sir Max K. Horton was born in 1885, and entered the Royal Navy in 1900. He became famous in the war of 1914-18 for his daring submarine exploits, which he began on 14th Sept. 1914, when he sank the German light cruiser "*Hela*," of 2,000 tons, six miles south of Heligoland. She was the first enemy warship to be sunk by a British submarine in that war. His second victim was the German destroyer S126, of 413 tons, and later in the war he sank a 13,000 ton German battleship, two more destroyers, three transports, and several merchant ships. The last submarine he commanded was the M.1, which was the first to carry a 12 in. gun.

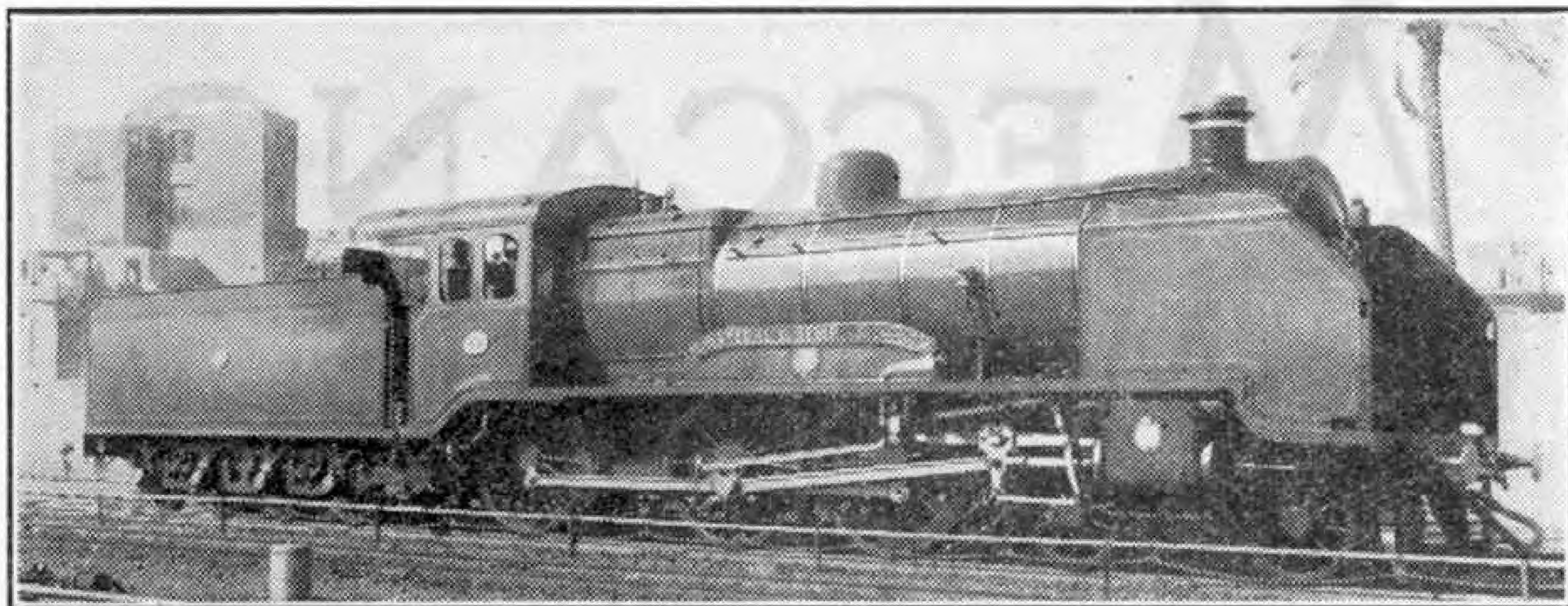
At the outbreak of the present war, by which time he had been promoted to

Vice-Admiral, he was given command of the Northern Patrol; and in January 1940 he was made Flag Officer, Submarines.

In his new post of Commander-in-Chief, Western Approaches, Sir Max is directing the Battle of the Atlantic, and applying his vast experience of submarine warfare to defeating the U-boat menace.



Admiral Sir Max K. Horton, K.C.B., C.B., D.S.O.,
Commander-in-Chief, Western Approaches.



Egyptian State Railways 4-6-0 Locomotive No. 67—converted from one of the standard "Atlantics."

Railway Working in Egypt and the Sudan

By O. S. Nock, B.Sc., A.M.I.Mech.E.

THE vital campaign in the Middle East, that has been fought stage by stage since the first invasion of Egypt by the Italians in 1940, has naturally focussed the attention of railway enthusiasts upon the lines behind the desert fronts. They are of very great interest, for while the group of railway routes in the Nile valley, and delta, were built for the conveyance of peacetime commerce and Egypt's vast tourist traffic, the line running along the coast westward from Alexandria was strategic from the outset. At the outbreak of war with Italy the terminus was at Mersa Matruh, though it has since been extended beyond the frontier and into Libya. This line provides an interesting parallel to one of the principal routes in the Sudan, that from Wadi-Halfa to Khartoum; this latter was built purely as a military railway, on the 3 ft. 6 in. gauge, during Lord Kitchener's first campaign in the Sudan. At present there is no rail connection between Egypt and the Sudan, but if ever such should be established it will provide yet another exasperating example of break of gauge, for in Egypt the 4 ft. 8½ in. gauge is standard.

Gradients hardly exist on the Egyptian State Railways, though the flat country of the desert and the Nile delta provides one curious operating problem of its own. On the most important section of line between Cairo and Alexandria, the wind is almost always north. It is not merely a case of the prevailing wind, it is constantly so, and in the summer when the winds are at their worst the effect is to

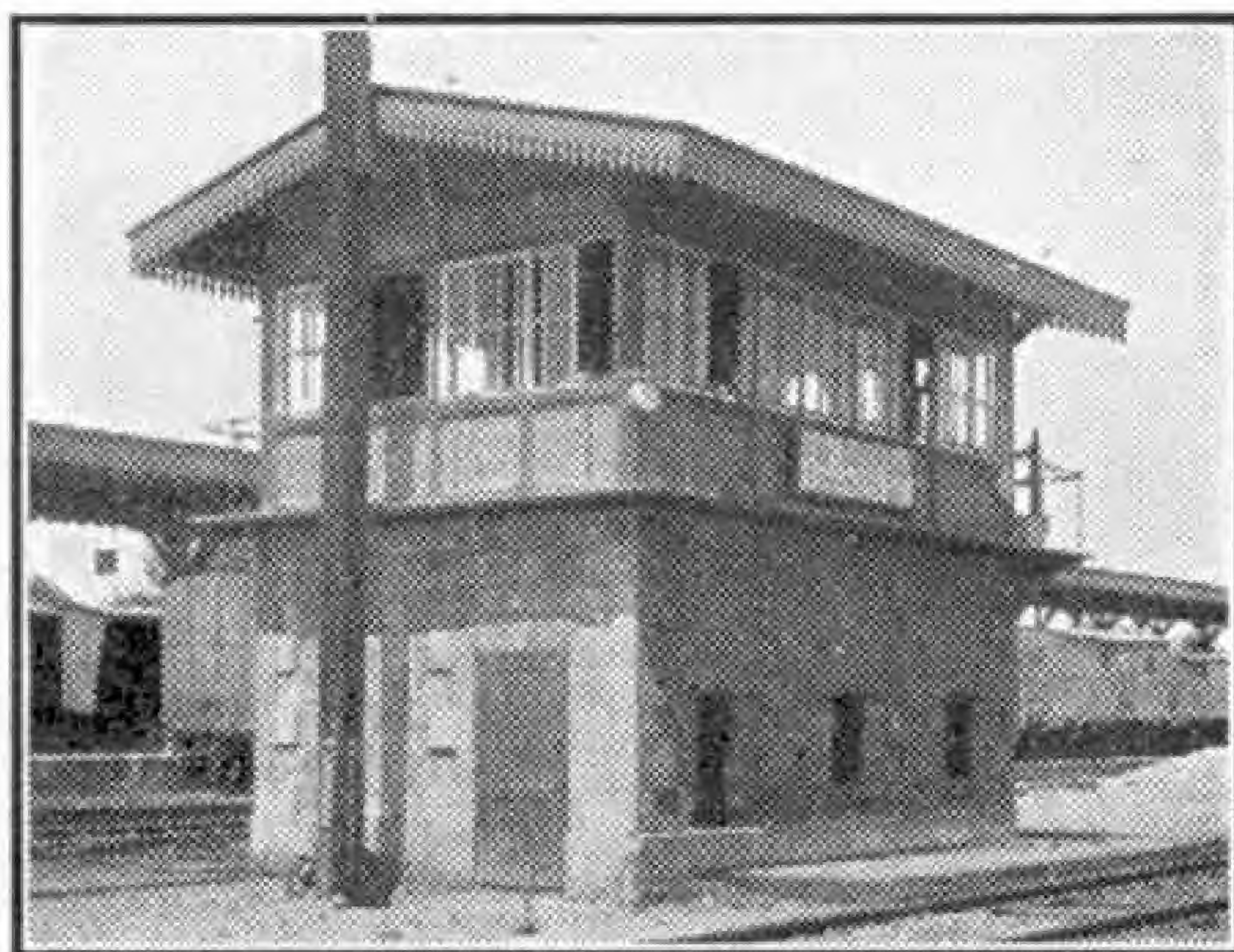
increase coal consumption by nearly 30 per cent. over that used on the south-bound run.

In recent months the graphic pictures drawn by war correspondents will have given many people a vivid impression of conditions in the desert, and the railway enthusiast may well wonder how it is possible to keep the lines open for traffic in times of severe dust and sandstorms. Sand is not the only trouble, however. The rainfall is erratic, and violent thunderstorms, accompanied by cloudbursts, may occur without the slightest apparent reason, when in other years there may be no appreciable rainfall at all. The utmost vigilance is needed at all times if lines through the desert are to be efficiently maintained.

Wind across the desert produces effects something akin to driving snow; the fine sand is driven far and wide, packing up in the cuttings, and very soon silting up the rails. In a few hours miles of railway line are apt to disappear from sight! Then there is nothing for it but to hold up all traffic while patrols go out on hand-propelled trolleys to clear the sand away. On one section of the Highland line in Scotland similar trouble is experienced from the sand of a neighbouring estuary; but the sand-blowers, or shields, erected in this case have been proved almost useless in Egypt and the Sudan. When the rains do come they descend upon a veritably baked earth, and the resulting surface water will sweep across miles of countryside, causing washouts at

many points on the railway. In the Sudan particularly it has become a regular practice to suspend all traffic after rain, until the line has been thoroughly examined. To minimise the effects of such storms, bridges and culverts have been constructed at points where heavy flood water is anticipated; but the trouble is often so localised that an embankment may be breached in proximity to a culvert through which no water whatever passed.

The almost total absence of gradients on the Egyptian State Railways has resulted in locomotives of somewhat modest proportions being generally favoured, although the loads are at times quite heavy; as long as 40 years ago the handsome British-built 4-4-0 locomotives were taking 300 to 350-ton loads on the Cairo-Alexandria expresses. These engines were painted a deep crimson, and with polished brass domes and safety valve columns, a copper-capped chimney, and a canopied cab they looked exceedingly smart. Somewhat later the "Atlantic" type was introduced into Egypt, but the engines concerned were no mere enlargement of the existing 4-4-0s; they were an exact copy of the celebrated De Glehn compound 4-4-2s running on the Northern Railway of France. This famous design attracted much attention among locomotive engineers in various parts of the world. It was adapted to English conditions, and three De Glehn compound "Atlantics" worked for many years on the Great Western Railway. An enlarged version of the same general design was worked out to the requirements of the Bengal Nagpur Railway, in India. Only in Egypt, how-



A typical signal box.

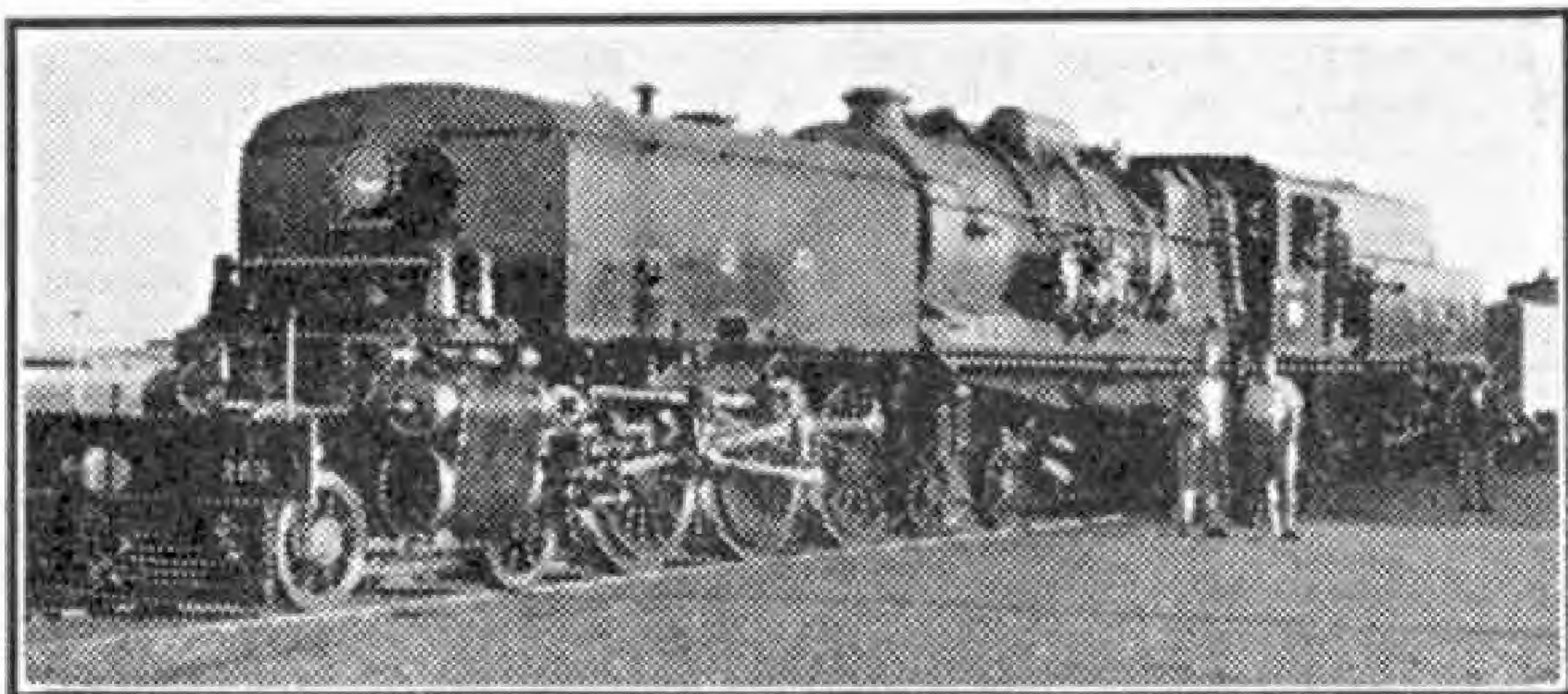
principal services have been operated by a class of 80 simple 4-4-2s of handsome appearance. One of these engines, experimentally converted to a 4-6-0, is illustrated on page 2. One of the most curious points about these "Atlantics" is the way in which they were built. The first five were built by a German firm in 1913; the next 20, in 1920 by the Baldwin Locomotive Company in the U.S.A.; then in 1925 came a batch of 35 built in Scotland by the North British Locomotive Company; while of the 20 remaining, 15 were built in Germany and the final five in France!

A few years ago some very fast running was made experimentally by one of these engines, No. 56 "*King Fouad I*," one of the Scottish-built batch. With a load of 202 tons the 126.1 miles from Cairo to Alexandria were covered in 119½ minutes, despite a delay of 10 minutes en route through a donkey obstructing the line.

The maximum speed attained was 77.7 m.p.h. At the same time 202 tons is a light load for Egyptian expresses; in ordinary service these "Atlantics" take up to 500 tons.

In recent years Egyptian locomotives have begun to take on a new and highly distinctive appearance. Two new classes have been introduced, one having the 4-4-0 wheel arrangement, and the other of the "Mogul" type.

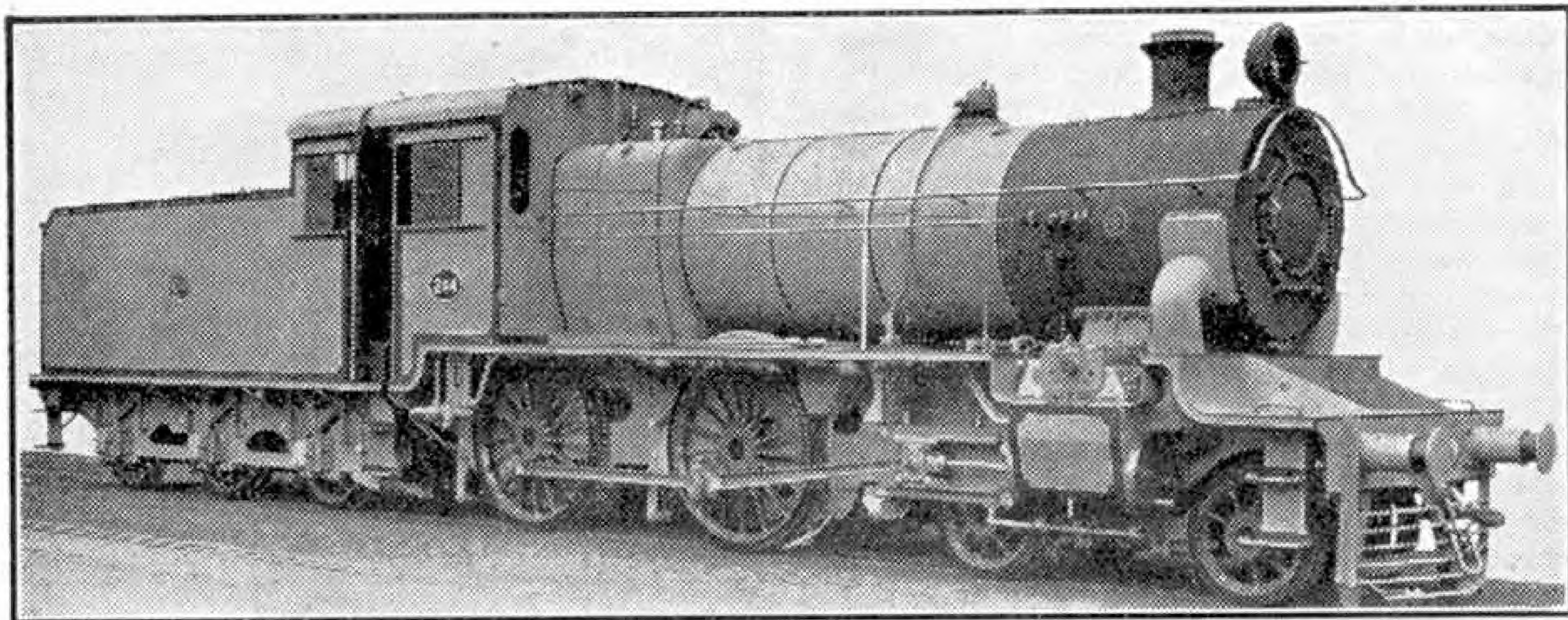
By the courtesy of the North British Locomotive Company I am able to illustrate one of the 4-4-0s. The domeless boiler, top feed, commodious cab, and the position of the outside steam pipes, will at once be noticed in a study of this very original outline; the Caprotti valve



Sudan Government Railways. One of the giant 4-6-4 + 4-6-4 Beyer Garratt engines. Photograph by courtesy of Beyer, Peacock and Co. Ltd.

ever, was the Nord design adopted in its entirety.

Shortly before the last war some British-built 4-6-0s were put to work, but for the level conditions obtaining on the Egyptian main lines "Atlantics" have been found most suitable, and until quite recently the



Egyptian State Railways new 4-4-0 locomotive (with Caprotti valve gear) built by the North British Locomotive Co. Ltd., by whose courtesy this photograph is reproduced.

gear is used, and the cam-box is prominent above the cylinder. The fire-box is of steel, and fitted with a thermic siphon, for improving the circulation of water and so giving more efficient evaporation. Eight out of the 26 engines so far put into service are equipped for burning heavy oil fuel. The coupled wheels are small by English 4-4-0 standards, only 5 ft. 6½ in. diameter; but with an excellent front-end the engines are free and fast runners. Their nominal tractive effort is 17,220 lb. against the 19,520 lb. of the older "Atlantic" engines previously referred to.

The new "Moguls," of which 70 are now in service, are rather more powerful, having a tractive effort of 25,270 lb.; this increase over that of the new 4-4-0s is due mainly to the use of a higher boiler pressure. 225 lb. per sq. in. against 180 lb. per sq. in. Although of very similar appearance to the 4-4-0s, the 2-6-0s have the rather severe line of the boiler top broken by the two cylindrical chambers of the A.C.F.I. feed-water heater straddling the boiler barrel. A point of interest in connection with the 4-4-0s is that they were shipped from Glasgow fully assembled, all 26 engines and tenders being conveyed in the same vessel.

The flat country through which the lines from Alexandria, and Port Said, to Cairo run is saved from monotony, from the railway traveller's point of view, by the numerous agricultural activities to be seen. The land is rich and productive, and every field would seem to have its workers; while the almost boundless landscape will occasionally be punctuated by the beautiful wing-shaped sail of some primitive ship passing along one of the canals that intersect the Nile delta region. Far away to the west, and southwest, are the low hills of the desert, while on nearing Cairo the traveller will be thrilled by a first and very distant sight of the great pyramids. But before continuing southward to the Sudan there are one or two points to be mentioned in concluding this brief sketch of the Egyptian State Railways. The general aspect of the system is British, though with those features, such as louvred locomotive cabs, and cowcatchers, that one sees in India. The signalling is based on British practice, with lower-quadrant semaphores, though at Cairo colour-light signalling and electro-pneumatic point operation is installed.

From Cairo southward the standard gauge extended to Luxor only until the year 1926; the remainder of the long route of over 450 miles beside the Nile, to Aswan, being laid on the 3 ft. 6 in. gauge. From Aswan a short branch continued to Shellal, which is the place of embarkation for the river steamers for Wadi Halfa, the most northerly point reached by the Sudan Government Railways. In 1925-6, however, a most interesting process of gauge conversion was carried out between Luxor and Aswan.

It was important that traffic on this route should be interrupted as little as possible, and the procedure adopted was rather unusual. All the embankments and cuttings had already been widened, and then sections of standard gauge track were assembled alongside the existing track, though with only one rail fixed. I should explain that the 3 ft. 6 in. gauge line was laid with fairly light rails, and in converting, much heavier rails were put in to permit of the largest locomotives being used. At the time of change-over the new broad gauge permanent way was laid in position and the narrow-gauge rails relaid on the new sleepers. This work was done section by section, and with a minimum of interference to the traffic, which of course had to be conveyed on the narrow gauge till the whole line was completed. The second standard gauge rail was laid in after the line had been restored for narrow gauge traffic. The night expresses from Cairo ran through to Aswan, on standard gauge throughout, for the first time on 31st October, 1926.

The main line of the Sudan Government Railways also follows the Nile for a large part of its length, though the northern part strikes through the heart of the Nubian Desert, through a vast tract of waterless country, with severe sandy conditions and temperatures reaching at times as much as 160 deg. F. in the sun. In addition there is an important line running east from Atbara, the headquarters of the system, to Port Sudan on the Red Sea. This latter route includes the only severe grading encountered anywhere in Egypt or the Sudan. The distances are great—378 miles from Wadi Halfa to Atbara, and 294 miles from Atbara to Port Sudan. From Port Sudan, another line runs southward, roughly parallel to the frontiers of Eritrea and Abyssinia, to Sennar, on the Blue Nile; and lastly there is the continuation of the main line up the Nile valley from Atbara, passing through Khartoum, to link up with the frontier line at Sennar, 361 miles from Atbara.

Although laid on the 3 ft. 6 in. gauge throughout, there is a considerable difference between the weight of rail used on certain sections, the heavy 75 lb. rails are used only in the central portion of the great north-south main line, and between Atbara and Port Sudan. The existence of so much light rail 50-52 lb. per yard, limited the sphere of operation of the heavy "Mikad," engines, and to cope with an increasing traffic some articulated locomotives of the Beyer-Garratt type were purchased for use on the 50 lb. rail sections. These fine engines, having the 4-6-4 +4-6-4 wheel arrangement, have a tractive effort of 38,400 lb. They are fitted with the A.C.F.I. feed-water heater, to reduce water consumption.

Altogether railway operation in Egypt and the Sudan is a tough job, though with the Beyer-Garratt engines freight trains loading up to 1,500 tons are now worked with success.

San Francisco's Chinese Telephone Exchange

Numbers Optional and Calls may last Hours

By Harold J. Shepstone, F.R.G.S.

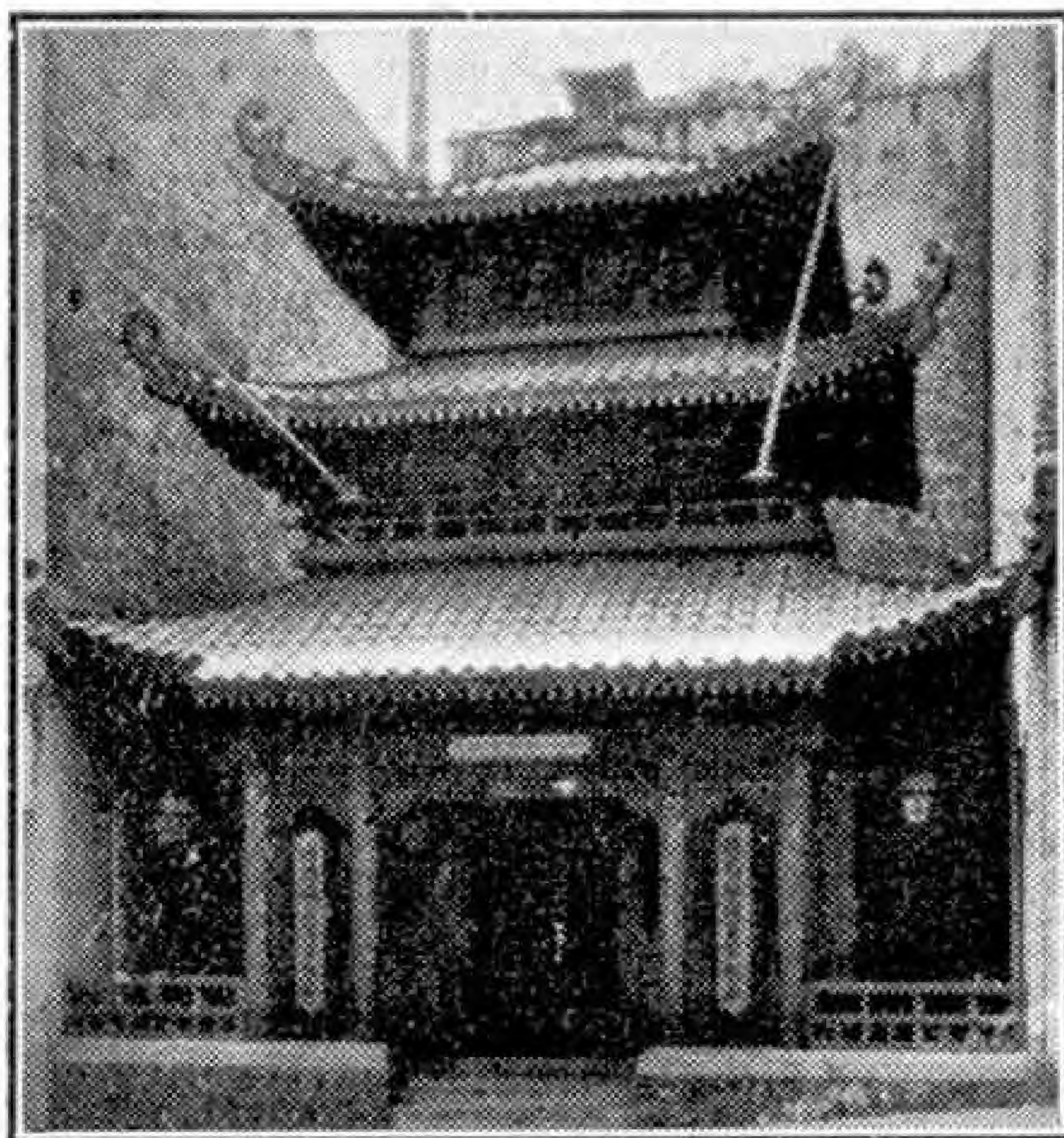
ONE of the sights of San Francisco is its Chinese quarter with its purely Oriental theatre where you can watch a Chinese play that may last a week, visit a Chinese joss-house and burn incense before the shrine, take tea in a Chinese restaurant, and purchase Chinese goods in its stores and shops. San Francisco's Chinatown occupies 14 square blocks where dwell some 17,000 Chinese, living and observing much the same customs as do their brethren in Old China.

An interesting feature of the colony is its telephone exchange, built in the form of a gaily decorated pagoda. Enter it and the deception is at first still maintained. The ceiling is adorned with dragons and the furniture is distinctly oriental in design. Everything is in black or red lacquer, even the great Chinese lamp hanging from the roof.

But behind a massive, carved grillwork screen, approached through a carved doorway, is the telephone switchboard. Peep through the doorway and you detect a semi-circular row of nimble-fingered women, almond-eyed and traditionally garbed, perched on tall chairs. Before them the switchboard lights flash and twinkle. Plugs pop in and out to a staccato accompaniment of Chinese chatter. You quickly realise that so far as telephone equipment is concerned the exchange is distinctly modern.

The exchange is in charge of a capable Chinese lady, Mrs. Chan, who kindly gave me some interesting particulars about this novel office. It was founded some 40 years ago by her father, a graduate of the University of California and editor of the first Chinese newspaper in San Francisco. When he started the exchange there were only 100 subscribers, now there are 2,200 telephones.

The operators of this exchange must know seven different Chinese dialects, and of course English. While each subscriber has a number, the operator is expected to know the name and address of that number as well. Many of the subscribers never give a number, merely requesting to be put through to so-and-so. The exchange acts also as an information bureau. Often from some distant city, New York, Los Angeles, or Vancouver, come requests to locate some Chinese resident. The 20 girls who form the staff must act also as interpreters for new arrivals who speak no English, and as advisers for those who seek assistance.



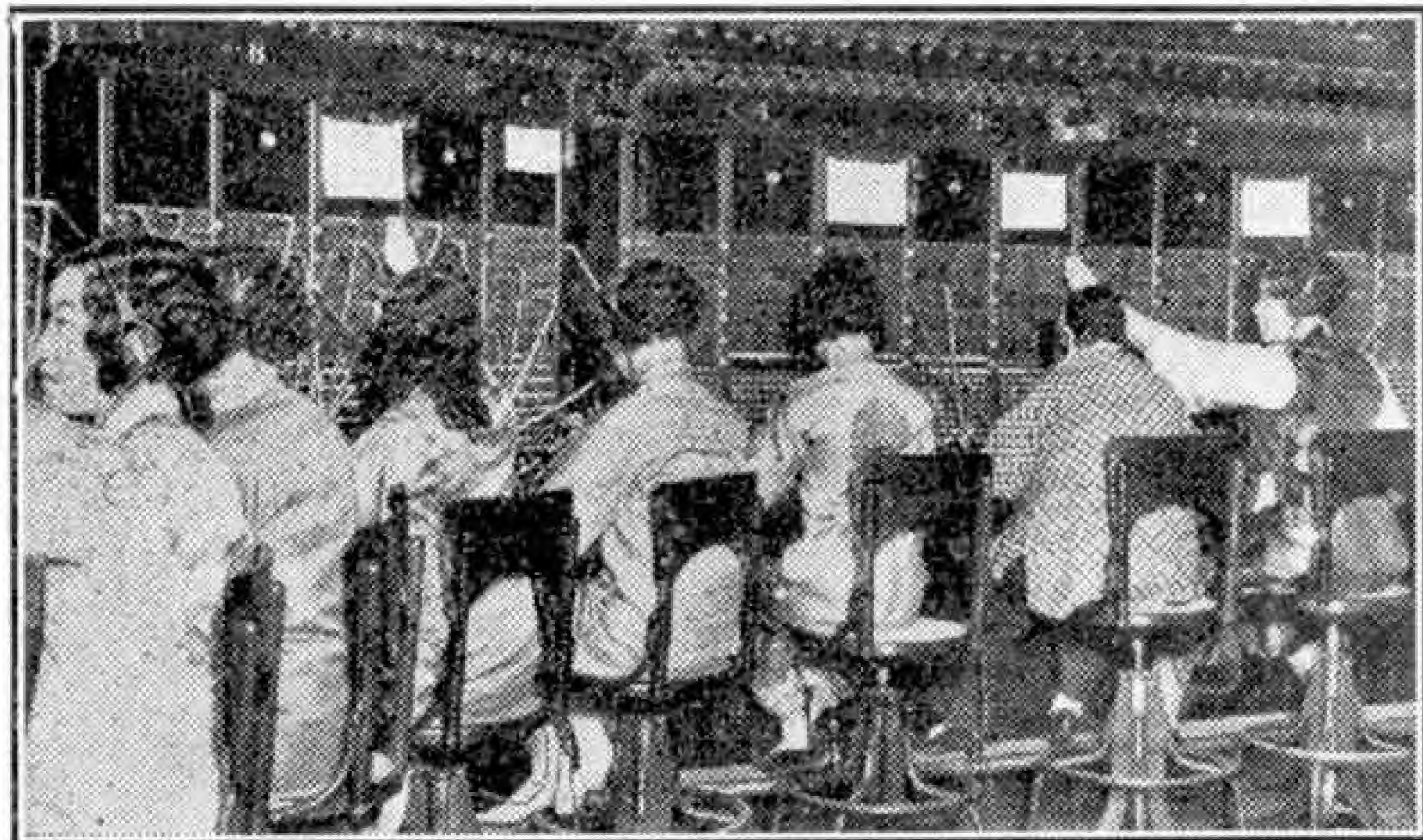
Chinese Telephone Exchange, San Francisco.

A new operator spends her first days studying the names, addresses, and telephone numbers in the Chinese directory. After two or three months she has mastered the routine and usually can recognise the party wanted without the number being given.

There are several differences between the Chinese and the other exchanges. One of the chief concerns the rush hours. Orientals go to bed late and sleep most of the morning. Then at noon they begin to use their telephones for marketing. From 7 to 8 p.m. they use them for social calls, and after midnight is perhaps the busiest time of all. There is no time limit for local calls and no Chinese operator is astonished to find a call that began at midnight still going gaily on at four in the morning! Such hearty conversations are conducted from bed.

The exchange has of course its own telephone directory. It is the only "hand-painted" directory in America. All the names, addresses and numbers are hand-lettered in Chinese characters, with the little brush used by Chinese instead of a pen.

This work is done by a young Chinaman whose father carried on the work before him. When a new directory is required the lists are handed to this expert. It takes him two weeks to get the 32 pages ready for the printer. It is two weeks of hard painting, using a thick brown ink called sepia, which is obtained from the ink-bag of a cuttle-fish found off the coast of California. This ink is bought in dried slabs and ground in a mortar. Then the powder is mixed with water and the liquid poured over a sponge, into which the painter of this strange book dips his brush.



Interior of the Exchange, showing operators at work.

Safeguarding Our Milk Supplies

A Modern Pasteurising and Distributing Plant

By T. R. Robinson

THE modern method of dealing with milk supplies is well seen at the large depots operated in the London area by United Dairies Ltd. The one described in this article, which distributes milk to South London, is typical, receiving supplies from a large area in the Southern counties, and despatching thousands of bottles daily to local distributing depots and retail shops. The milk comes to the depot by motor lorry. Supplies from the surrounding Home Counties arrive in cans collected directly from the farms, while those from the more distant localities are brought in large glass-lined cylindrical tanks mounted on lorries that bring milk in bulk from cooling centres in the country areas, or in similar tanks transported by rail.

Both types of vehicles unload at a special reception platform at the depot building. The milk is checked and tested, and the cans are emptied into a special tipping tank, connected by a pipe-line to a series of refrigerating tanks, each of 3,000 gallons capacity, at the rear of the platform. The cans are then passed to a washing machine, where they are inverted and placed on a reciprocating conveyor that carries them through a cleansing tunnel. As they pass through they are thoroughly washed and sterilised at the rate of 10 a minute, and finally delivered on to the platform again, ready for re-loading on the lorry that brought them to the depot.

Bulk supplies also are unloaded into the refrigerating tanks, but for this a branch of the pipe-line is coupled directly to the tank on the lorry by union pipes and adjustable joints. A pump mounted on the platform then transfers the milk from lorry to tanks.

From the tanks on the reception platform the milk is next transferred by air pressure to a further set of refrigerating tanks on the top floor of the building. This second group of tanks forms the supply for the pasteurising plant, and milk drawn from them for pasteurisation flows by gravity through a pipe-line to a "regenerator," where it is raised to a temperature of 120 deg. F. by the transference of heat from milk already pasteurised. The way in which this is done is very ingenious. Hot milk flowing from the pasteuriser is passed through a series of cells in the regenerator, and these cells are so arranged that they are close beside the similar cells through which the cold milk is passing. The effect is to transfer a great deal of the heat no longer required by the pasteurised milk to the milk that is flowing to the pasteuriser, cooling the one and heating the other without needless waste of energy. From the regenerator, the milk proceeds to a filter unit, which removes any small particles of grit or dust, and then to a heater, where its temperature is raised to 145 deg. F., the correct temperature for pasteurisation.

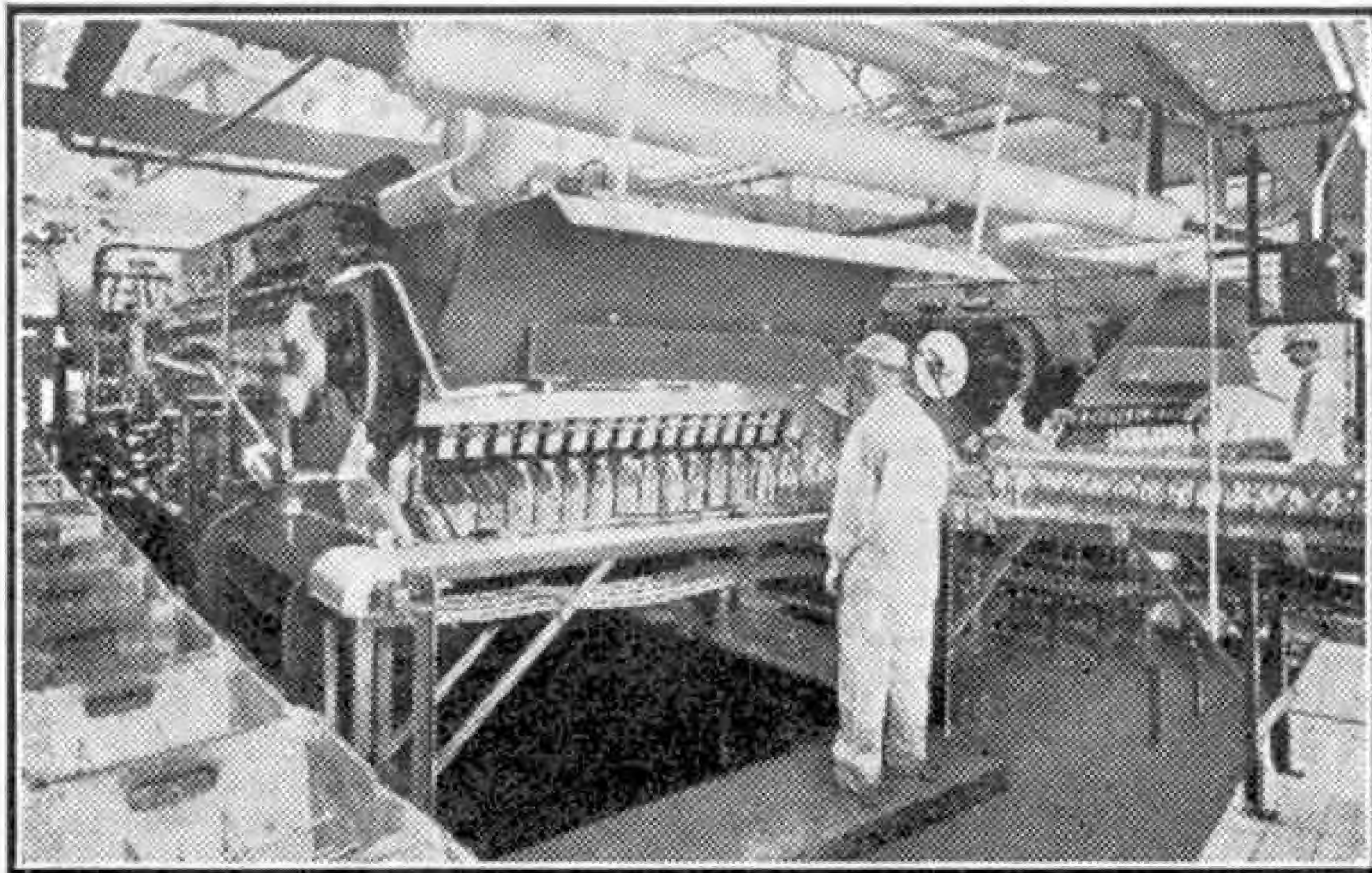
After heating, the milk is drawn by vacuum to one of five stainless-steel holding tanks, where it is retained at its heated temperature for 30 min. The five tanks work in a regular cycle, all being under the control of a central master valve. As this slowly turns, it supplies vacuum or pressure to each tank as required, and it is set to fill each tank in turn with the heated milk, retaining the tankful for the correct

time, and finally passing the pasteurised milk on to the regenerator and cooler.

The object of pasteurisation is to destroy all harmful organisms that may be present, without subjecting the milk to such temperatures that its qualities are impaired. The automatic plant at the depot carries out the process perfectly, and works almost without supervision.

After leaving the pasteuriser and passing through the regenerator, the milk flows first to a water cooler and then to one in which brine cools it below 50 deg. F. It is then sufficiently cold to be passed to a series of stainless steel tanks that feed the bottling machines.

The treatment and cleansing of bottles is one of the most important processes carried out at the depot. It would be quite useless to pasteurise milk, and to take care to maintain its purity, if the bottles in

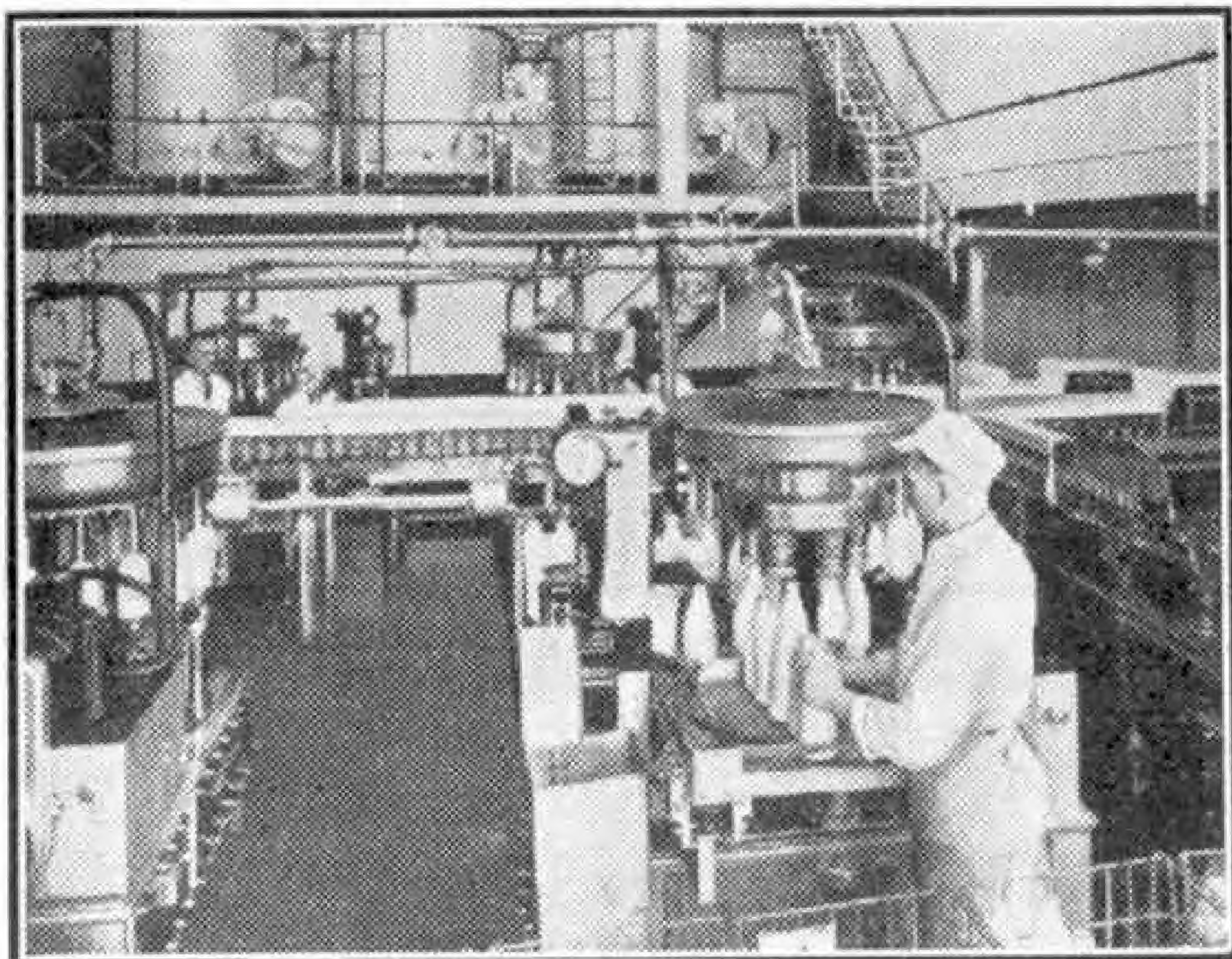


Milk bottle-washing machines in operation. For the illustrations to this article we are indebted to the courtesy of United Dairies Ltd.

which it was despatched were not perfectly sterile and free from dirt of any kind. A very thorough cleansing therefore is given to each bottle in a special washing machine.

The bottles arrive in crates, and as these are unloaded from the carts and lorries they are placed on a roller-type conveyor that brings them to the loading end of the bottle-washing machines. These operate on the conveyor system, the bottles being inserted in rows of pockets formed in strips that stretch across the width of the machine. The pocket-strips are linked together, side by side, to form a wide link-chain that moves right through the machine. The action takes place step by step, the chain moving one strip-width at each stage, and by so doing giving time for each row of pockets to be loaded with bottles.

The method of inserting the bottles in the pockets of the conveyor is particularly neat. It would take too long to load each pocket directly by hand, so the bottles are placed in a row on a platform that spans the width of the pocket-strips at the point of loading. Ridges on the surface of the platform space the bottles correctly, and as the conveyor moves forward a cam allows a counterweight to tilt the platform to a sloping position. This causes the bottles to slide into the pockets, and as soon as this happens, the platform returns to its original position, ready for more bottles. The loading is carried out by two



Full milk bottles passing under the capping heads. Behind and on the left are filling machines.

operators, whose task is to keep the machine supplied with bottles and to reject any that are defective.

As the chain of strips moves forward, the bottles pass, mouth downward, through a series of cleansing processes, the first of which is a rinse with tepid water to remove any stale milk. The next treatment is more powerful, the bottles being immersed in a tank containing a detergent solution that effectually sterilises them. Moving onward, the bottles are next carried over fixed jets of water that spray them internally at a considerable pressure, and so remove all traces of the detergent solution. Even after this they receive four internal rinsings, the last with sterile water, which makes them ready for the reception of the milk. While the inside is being cleansed, the outside is not forgotten, for sprays deal with this part of the work, and leave the exterior of each bottle clean and bright.

By the time the cleansing processes are completed, the bottles have traversed the length of the machine and reached the unloading end. Here, as the conveyor chain moves round, the bottles pass behind guards, which retain them in their pockets until they are in an upright position, just above a conveyor that takes them to the bottling machines. The movement of the chain is timed to act with a series of arms that rise, receive the bottles as they move out from under the guards, and transfer them without damage to the conveyor. The steady, precise movement of the machine, as row after row of bottles is transferred from chain pockets to conveyor belt, is most fascinating to watch.

As the bottle-washing section of the building is close to the bottle-filling section, it is a simple matter to convey the bottles from one to the other, the conveyor passing through a tunnel in the wall dividing the two sections. The process that follows, that of filling each bottle with its measured quantity of milk, is the most interesting of all. The machines are quite automatic, the operators being called upon only to place the filled bottles in crates, which also arrive from the bottle-washing section on yet another conveyor.

The milk is fed by pipe-lines from the stainless steel tanks previously mentioned to small circular tanks on the machines. Under the tanks are spring-loaded milk valves arranged round their edges. As the bottles arrive at the bottling machines

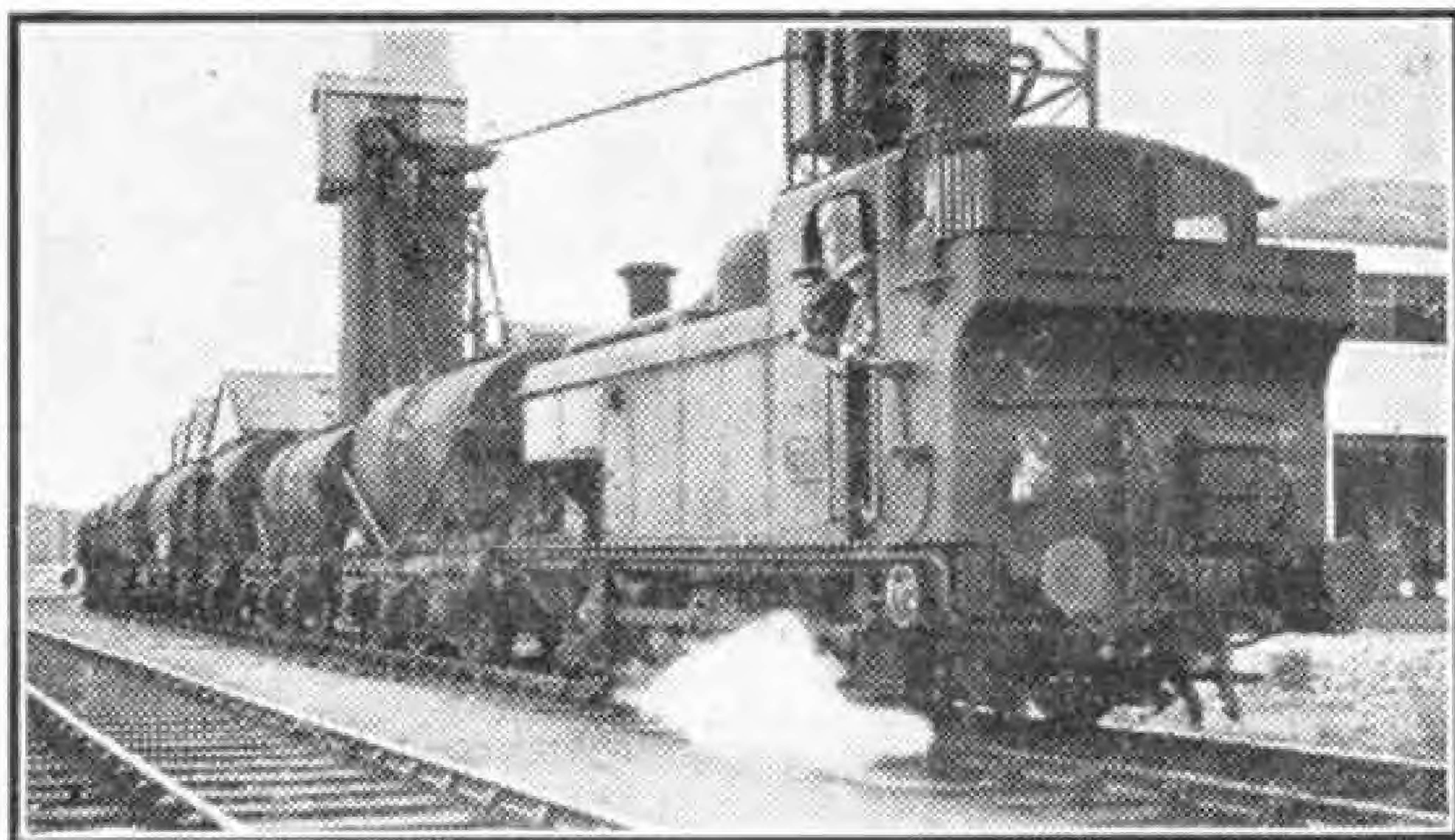
they come into contact with circular plates provided with a number of indentations around their circumferences. These plates are known as "selector stars," and as they revolve, a bottle is caught by each indentation in turn and carried from the conveyor to one of a ring of small pedestals arranged in a circle just below the milk valves of the circular tanks. Both the circle of pedestals and the milk-tank and its valves revolve together at the same speed, and as the pedestals move round, oil is forced into small cylinders at the lower ends of the pedestals. This action causes each pedestal in turn to rise, bringing the mouth of the bottle that it carries against the corresponding milk valve. As rotation continues, a measured quantity of milk, quart, pint or half-pint, according to the size being filled, is fed into each bottle. It is the pressure of the mouth of the bottle against the valve that causes it to operate, and so milk is not released from the valve above an empty pedestal. As soon as the bottle is filled, the pedestal is allowed to descend again, and the milk valve closes and cuts off the supply.

The filled bottle still moves forward on its pedestal until it reaches a point where a further selector star transfers it to the capping head of the machine. As the bottle moves across from one position to the next, it receives its aluminium foil cap, which has been cut and formed from a reel of foil by a small subsidiary machine mounted on the bottling machine. The cap is dropped down a chute on to the bottle mouth, and a further action, somewhat similar to that of filling, causes the bottle to rise into contact with a gripper that moulds the cap firmly in position.

Another selector star then removes the bottle from the capping head and delivers it to a platform, ready for the operator to load it into a crate. The loaded crates pass along their conveyor to a further loading platform, where they are placed in the vans that take them to the depots supplying customers and shops.

Even this does not quite end the story, for each depot is provided with a very completely equipped laboratory, the staff of which make frequent tests of the milk at every stage of its treatment, as well as of samples of the washing water of bottles, and even of the water used to wash and sterilise the pipe-lines and tanks. By this means, the whole process is controlled, and perfect cleanliness assured.

As an additional precaution, every section of the pipe lines connecting different sections of the plant, and every tank and machine is given a thorough cleansing at frequent intervals.



A milk train from the west. Each of the glass-lined containers shown holds 3,000 gallons of milk.



How Orolon girder track units have solved the problem of carrying a life-boat and its carriage over soft beaches, in which ordinary wheels would sink. Photograph by courtesy of Roadless Traction Ltd.

Engineering News

A Substitute for the Pneumatic Tyre

The upper illustration on this page shows a modern life-boat being launched from the beach by means of a tractor. The life-boat and its carriage weigh about 12 tons, but the Orolon girder track units supporting them carry them over the softest of beaches without sinking. The Orolon track unit is of special interest now that rubber has become short in supply, and there is great need for finding a satisfactory substitute for the pneumatic tyre. If we were compelled to go back to steel-tired wheels, speeds would have to be reduced greatly and road surfaces would be subject to extra wear and tear.

Orolon units act by reducing the pressure per square inch on road surface, and indeed this is so low that vehicles provided with them can travel over soft and rough ground without getting into difficulties. They are produced in sizes capable of carrying loads from 2 cwt. to 20 tons, and the lighter units can be used at speeds of 10, 15 and even 20 m.p.h. An additional advantage is that they act like the creeper tracks of a tank on meeting obstacles, climbing over them, the height that they can surmount depending on the size of the unit.

A New Magnetic Filter

In engineering work metallic swarf is carried away by the liquid used for lubricating or cooling the work. The swarf must be removed from circulation to prevent undue wear of tools and other troubles, and filters and settling tanks are used for this purpose. On certain operations, such as grinding, much of the metal is too finely divided to be dealt with satisfactorily in this manner, and the magnetic filter shown in the lower illustration on this page has been introduced by Philips Industrial (Philips Lamps Ltd.) to ensure its removal.

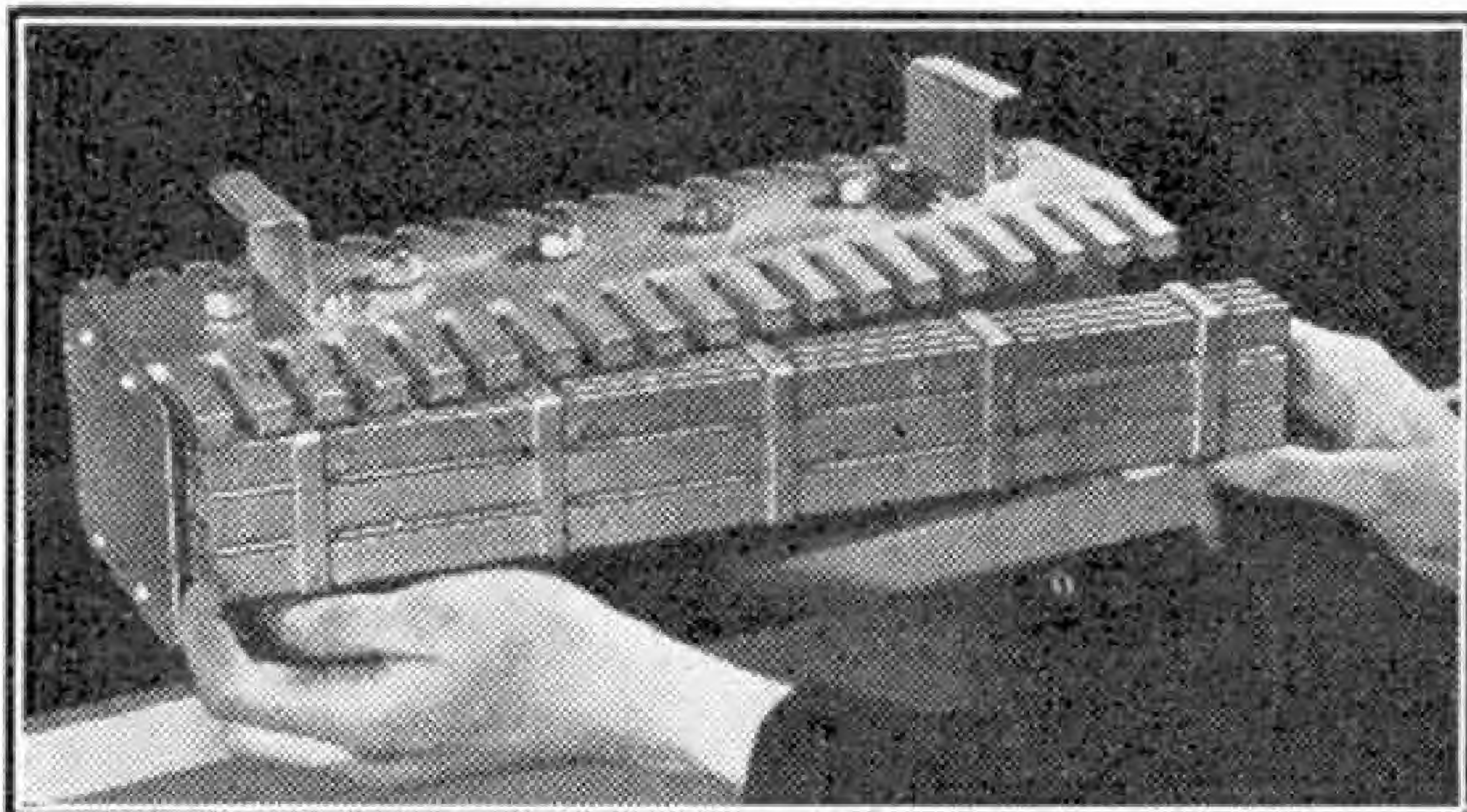
The filter is placed in a settling tank in the pipe line through which the lubricating or cooling liquid circulates. It almost fills the tank, so that it can deal effectively with the whole of the liquid. In it are a series of powerful permanent magnets of a special alloy, and the magnets are connected in parallel above and below by means of specially designed pole pieces. Between the jaws of the pole pieces there are cages provided with fine air gaps, in which the magnetic force is concentrated, and there the finely divided swarf in the circulating liquid is trapped. From time to time the filter unit is lifted out of its trough and each cage in turn is removed, in the manner shown in our illustration,

to have the fine swarf removed by washing or by the use of a jet of compressed air.

Electric Signalling in Tunnel Construction

Signals operated by an electrical eye have been installed to control traffic on a construction railway in a tunnel 13 miles in length that is being drilled through a mountain range in the Rockies. The purpose of the tunnel is to carry water through the mountains to the eastern side, where it will be used for irrigation and for producing electric power. The railway is of 2 ft. gauge, and consists of single track, with passing places at intervals, and on it ordinary signals could not be used because water and dirt would reduce their efficiency and make constant repair and replacement necessary. A system without either mechanical or electric switches connected to the track was required, and the electric eye provides this.

The track is divided into blocks, or sections, with passing places at their ends. At the beginning and end of each block are light-operated electric relays, each with two light sources to work it on the opposite



The Philips Magnetic Filter unit described on this page. Photograph by courtesy of Philips Lamps Ltd.

side of the track, so that the beams are interrupted when a locomotive or train passes them. The interruptions bring the relays into action, causing the signal lights to change as required so that the trains themselves switch on the red lights of signals controlling each section as they enter it, and the green lights as they leave it. The system works very efficiently; accidents are avoided, and the amount of waiting time at passing places has been reduced by a considerable extent.

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, we can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 6d., for postage.

"SEA-FLYERS"

By C. G. GREY (Faber and Faber. 7/6 net)

In *"Sea-Flyers"* Mr. Grey carries on the good work he began with *"British Fighter Planes"* and continued in *"Bombers."* He now deals with flying over the sea, tracing it from the pioneer work of the American Glenn Curtiss to the splendid achievements of Great Britain and the United States in the present war. It is a thrilling story and the author quite clearly revels in the telling of it. I suspect that at heart he is something of a pirate, and if he had lived in Elizabethan days he would certainly have been well to the fore among the sea dogs.

The first part of the book describes the early efforts of Glenn Curtiss to produce a genuine hydro-aeroplane, that is an aeroplane to fly off and on to water. The first man actually to fly off British sea-water in an aeroplane appears to have been Commander Oliver Schwann, R.N., and the credit for building the first successful water-flying machines apparently goes to the Short brothers at Eastchurch. British sea-flying on the Service side is closely linked with the names of Captain Murray Sueter, R.N. (now Rear-Admiral Sir Murray Sueter), and the indomitable four, Lieut-Commander C. R. Samson, Lieut. Reginald Gregory and Lieut. Arthur Longmore, all of the Royal Navy, and Lieut. Louis Gerrard, R.M.L.I.

From the very first the efforts of the small band of enthusiasts who tried to establish Service sea-flying met with suspicion and even direct opposition. To quote Mr. Grey: "The Naval officers who took to flying in the early days were regarded by most of the officers of their own rank as being either a bit queer or slightly objectionable." It is interesting to note that Mr. Winston Churchill realised the importance of aviation as soon as he came in direct contact with it, and after he became First Sea Lord he did a good deal of flying himself. He backed the efforts of Captain Sueter right up to the outbreak of war in 1914, and it is largely to him that we owe the great development of our sea-going Air Forces.

Mr. Grey gives us a detailed account of sea-flying during 1914-18. In the course of his survey he pauses to consider the idea of the seadrome, a self-contained island moored in deep water and resembling "a seaside pier that had broken loose." These structures would be used far enough from enemy coasts to be out of reach of shore-based dive-bombers and fighters, and should be able to protect themselves against long-range bombers. Their structure would be subdivided so as to make them practically proof against torpedo attack, and they would carry fighter-planes to attack oncoming aircraft. The hangars for aircraft would be below deck as in aircraft-carriers, and catapults would be provided from which to launch aeroplanes requiring a longer run than that given by the seadrome itself.

Such seadromes would each cost about one-eighth of the price of an aircraft-carrier. They would be moved by tugs, and probably would make a speed of eight to ten knots. "One can imagine," says the author, "the effect of a great fleet of these strange craft plodding slowly towards Japan escorted by warships to protect them against the Japanese Navy,

slowly and slowly creeping nearer to the Japanese cities, carrying vast numbers of aircraft, bombers and fighters, such as would overwhelm the Japanese Air Force and obliterate the Japanese cities. One can imagine the haste with which Japan's armies would be withdrawn from all the unfortunate countries which they have invaded. And think how cheaply such an attack could be made compared with the cost of doing it in the orthodox way with big warships."

In regard to the official view of the seadrome idea, Mr. Grey says: "I have good authority for saying that the Admiralty's own engineers cannot find any fault with the theoretical claims that are made for it, and the Air Ministry can find no faults with the proposed strategy and tactics involved."

An important section of the book deals with airships, ranging from the pioneer vessels of Santos Dumont, the Lebaudy brothers and Clément, to the German Zeppelin, the American rigid airships and our own R100 and the ill-fated R101. Here the author is on highly controversial ground, and in view of the unqualified condemnation of airships expressed in many expert quarters it is noteworthy that he believes that such vessels might have been of great value in the present war.

The big American airships *"Akron"* and *"Macon,"* filled with helium gas so that they were not inflammable were each built to carry half-a-dozen fighter aeroplanes that could be slipped to attack fighters from an aircraft-carrier, and could hook on again inside the airship. Both these airships were lost, but Mr. Grey believes that a little more experimenting would have revealed what was wrong with them. Such ships, he says, "could have kept up constant patrol over the Atlantic shipping-lanes by day and night, carrying depth-charges with which to sink enemy submarines, and search-lights with which to locate them at night while they themselves were out of reach of the submarines. During 1941, when the Focke-Wulf *"Kuriers"* started patrolling the Western Approaches to this country, the fighters from the airships could have driven them away, and there would have been no need for that hazardous method of catapulting fighters from ships in convoys, and trusting to luck that the pilots would not be drowned when they put the machines into the sea because they had nowhere to alight."

Part four passes in review the progress of sea-flying between wars, and deals very fully with the development of deck-flying and the growth of the "big boats." This is a particularly interesting section, in which the author introduces us to the men who designed and built the various machines. Here, as in his previous books, Mr. Grey takes us behind the scenes.

And now we come to sea-flying in the present war, of which we are given a survey of outstanding interest. In recounting our achievements the author has many critical comments to make, but his confidence in the future is sure. "We have never yet been beaten because of the inferior quality of our aircraft. And certainly we have never been, nor ever shall be, beaten because of the inferior quality of the officers and men of the Naval Air Service and the Royal Air Force."

The book is excellently illustrated.

Further book reviews will be found on page 34.

Owing to wartime difficulties, it is impossible to guarantee prompt delivery of books ordered as described at the head of this page, but every effort will be made to ensure speedy despatch.

Tunisia Past and Present

The Cradle of Western Christianity

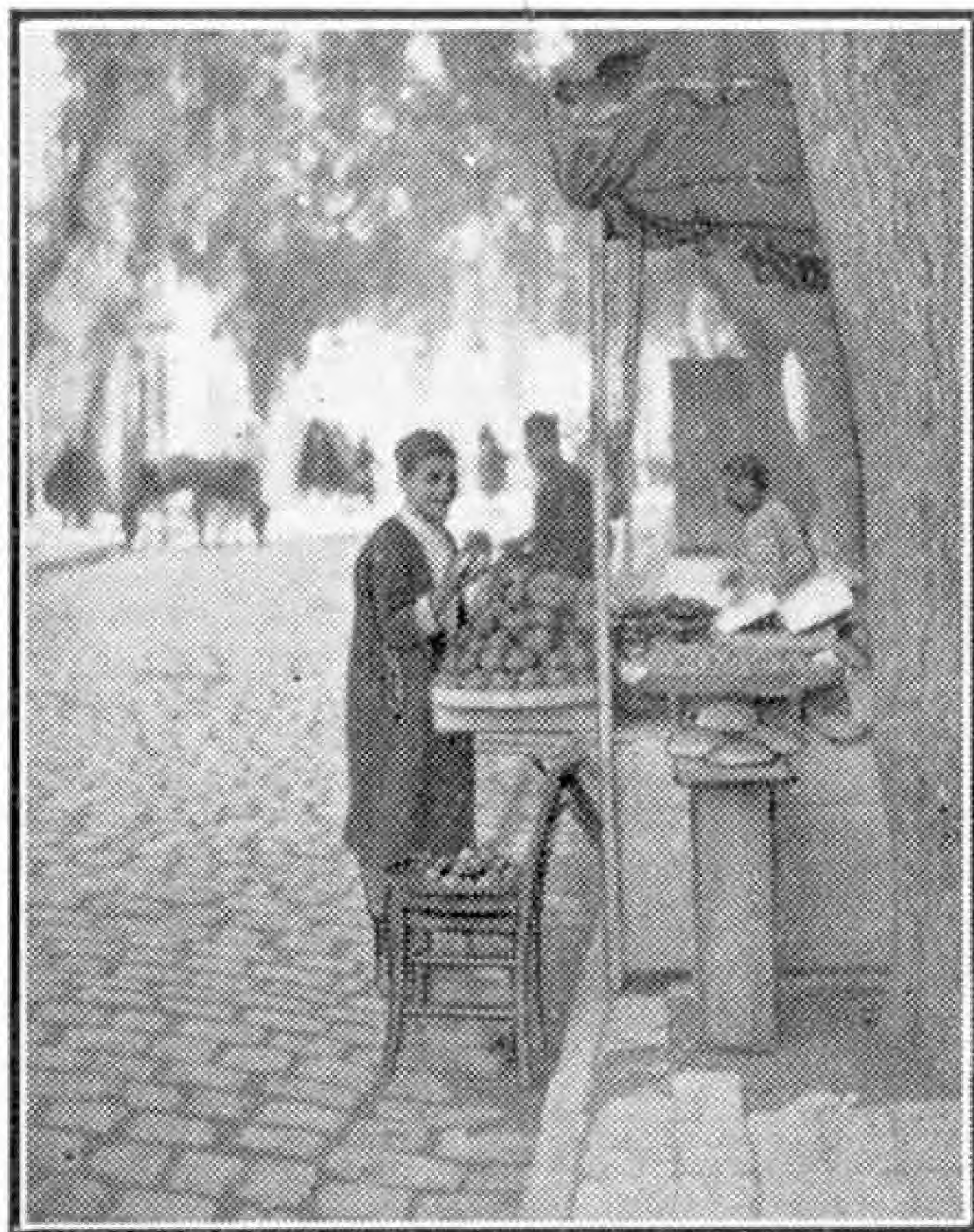
By Harold J. Shepstone, F.R.G.S.

TUNISIA lies between Algeria and Tripoli with the Sahara to the south, its most north-easterly tip being only some 90 miles from the Italian island of Sicily. Its comparatively narrow strait almost divides the Mediterranean into two great lakes. With its vineyards and olive groves it has not inaptly been termed an African suburb of Southern Europe.

It is in many respects a picturesque and fascinating land with a romantic past. Some 12 centuries before the birth of Christ, the Phœnicians, attracted by the wealth of the country, began establishing trading stations along its coast. The country was occupied by a people of the Berber race, who still form the main North African stock from the town of Tunis to Morocco, and from the Mediterranean to the Sahara. The Phœnicians founded the cities of Tunis, Bizerta, Utica and Carthage, the last of which became the capital of the great maritime empire of the Phœnicians in the Western Mediterranean. While Persia and Greece disputed the mastery of the eastern world, Carthage and Rome disputed the dominion of the west. After a stern siege Carthage fell to the Romans, and for a generation lay vacant, a mouldering heap of ruins.

Then Rome established a small colony in North Africa, and Carthage was rebuilt and became a mighty city, the capital of a Roman province that soon began to outshine Italy itself in wealth, in luxury, in art, and in the magnificence of its palaces, temples and public buildings. The new province became not merely the granary of Rome, but a breeding-ground for Roman citizens, a school of art and letters, and the cradle of Western Christianity. Several of the Roman Emperors, including Septimius Severus, one of the greatest, were African born. It was the African bishops, Tertullian in the first century, Cyprian in the second, and Augustine in the third, who built up the Christian Church in North Africa. For five centuries the new province was as Roman as Italy. Then in the seventh century fanatical hordes of Moslems swept across the continent, sweeping away not only the civilisation of Rome but the Christian Church as well. Since then the Mohammedan religion has held universal sway.

Tunisia to-day is about the size of England, some 45,000 square miles in extent, with a population of 2,720,000. It has been a French protectorate since 1881. There is, however, a native ruler, the Bey of



Orange seller in the streets of Kairouan. The streets of this Moslem holy city are shaded by pepper trees.

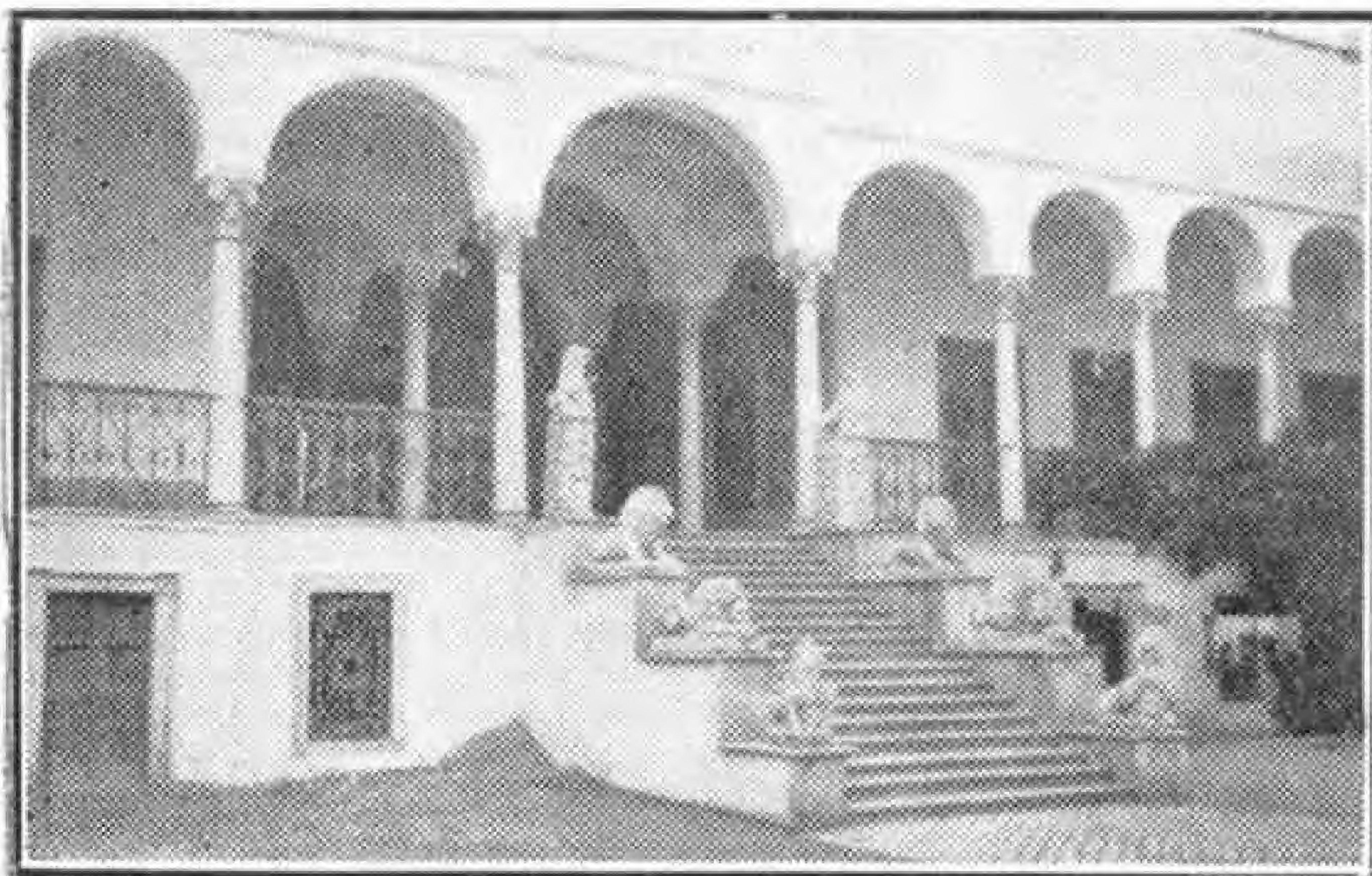
Tunis. There has always been a large Italian population, numbering when war broke out about 95,000. Italy has never forgiven France for forestalling her in the occupation of Tunis, which she had long coveted as her special heritage from the past.

The country is divided geographically into three well-marked belts. The north is mountainous, enclosing some well-watered and fertile plains. The south is desert, diversified by numerous cases in which the date palm yields a golden harvest. Tunis dates

are recognised the world over for their excellence. In the gorges of the mountains an Army veterinary surgeon discovered rich beds of phosphates, and the yield has been as high as two millions tons a year. Coal, copper, lead, zinc and iron ore also exist. Between the mountains and the desert lies a broad belt of rolling steppes which, in its lower levels along the coast, is extraordinary fertile.

Tunis, the capital, and the largest city in the country, with a population of just over 200,000, is built on a low neck of land between two lagoons. There is the old town and the new. The former, the native quarter, is surrounded by a wall. The newer, or European quarters, boast spacious boulevards, fine public buildings, restaurants, cafes and hotels—all the amenities of the West. The Italians, a numerous colony, greatly outnumbering the French, occupy their own quarter, which has all the appearance of an Italian town.

From the European quarters one



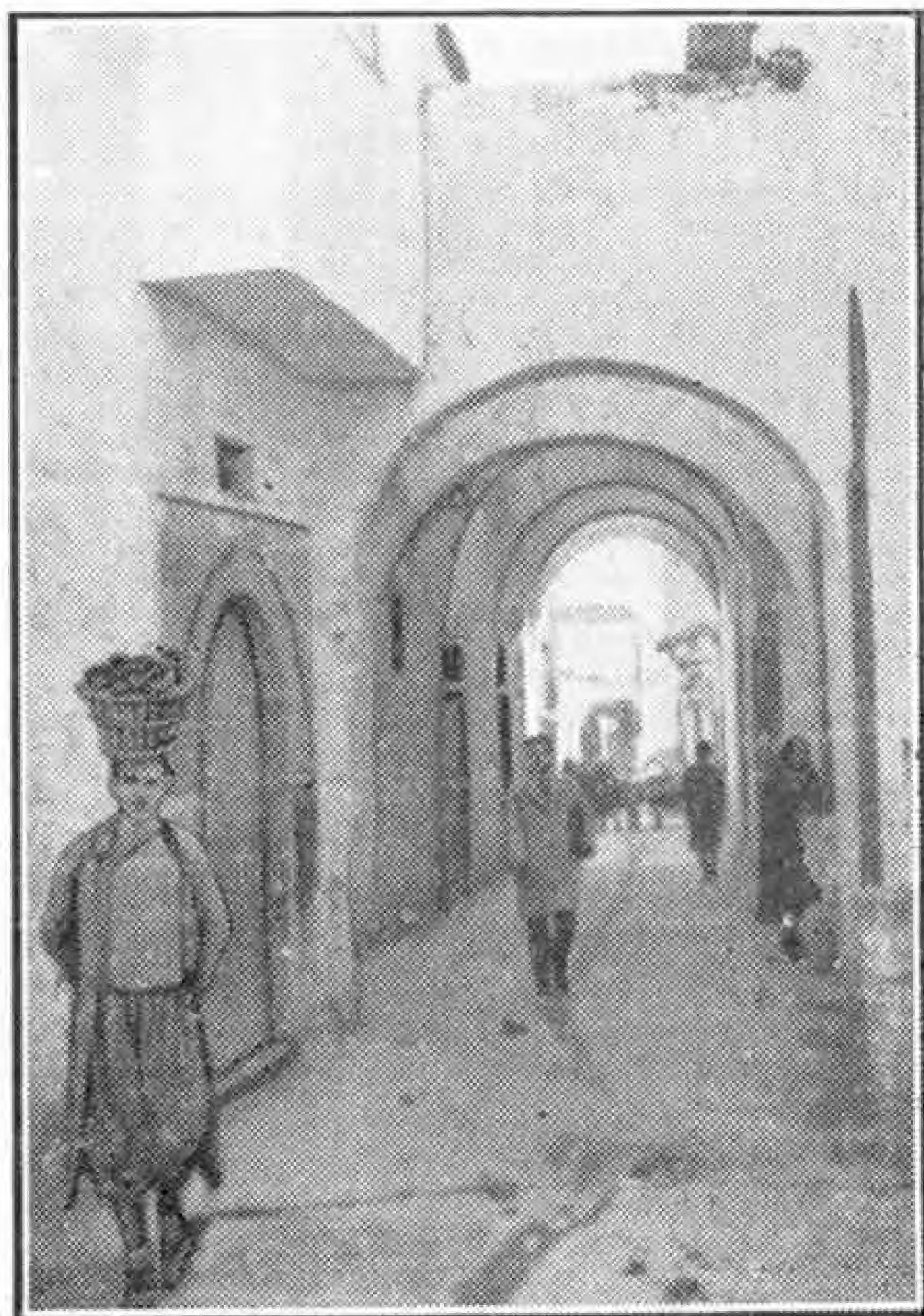
The Bey's Palace, Tunis.

passes through the imposing Roman-like arch of the Porte de France into an intricate maze of narrow lanes, and here are the souks. Each craft has its own souk, or street, which has been vaulted over like an arcade to afford a welcome shade from the glare of the African sun. There are the slipper-makers' souk, the tailors' souk, the fez cap makers' souk, the saddle makers' souk, the jewellers' souk, the carpet and rug souk, and the ladies souk where exquisite silks and embroideries are hidden away in the recesses of the most unpromising, dark little caves, offering endless scope for exploration and bargain hunting. In the centre of the souks is a small quadrangle arched round by rows of pillars. This was the slave market, and here, up to the beginning of the 19th century, after a successful pirate raid the corsairs displayed their captives.

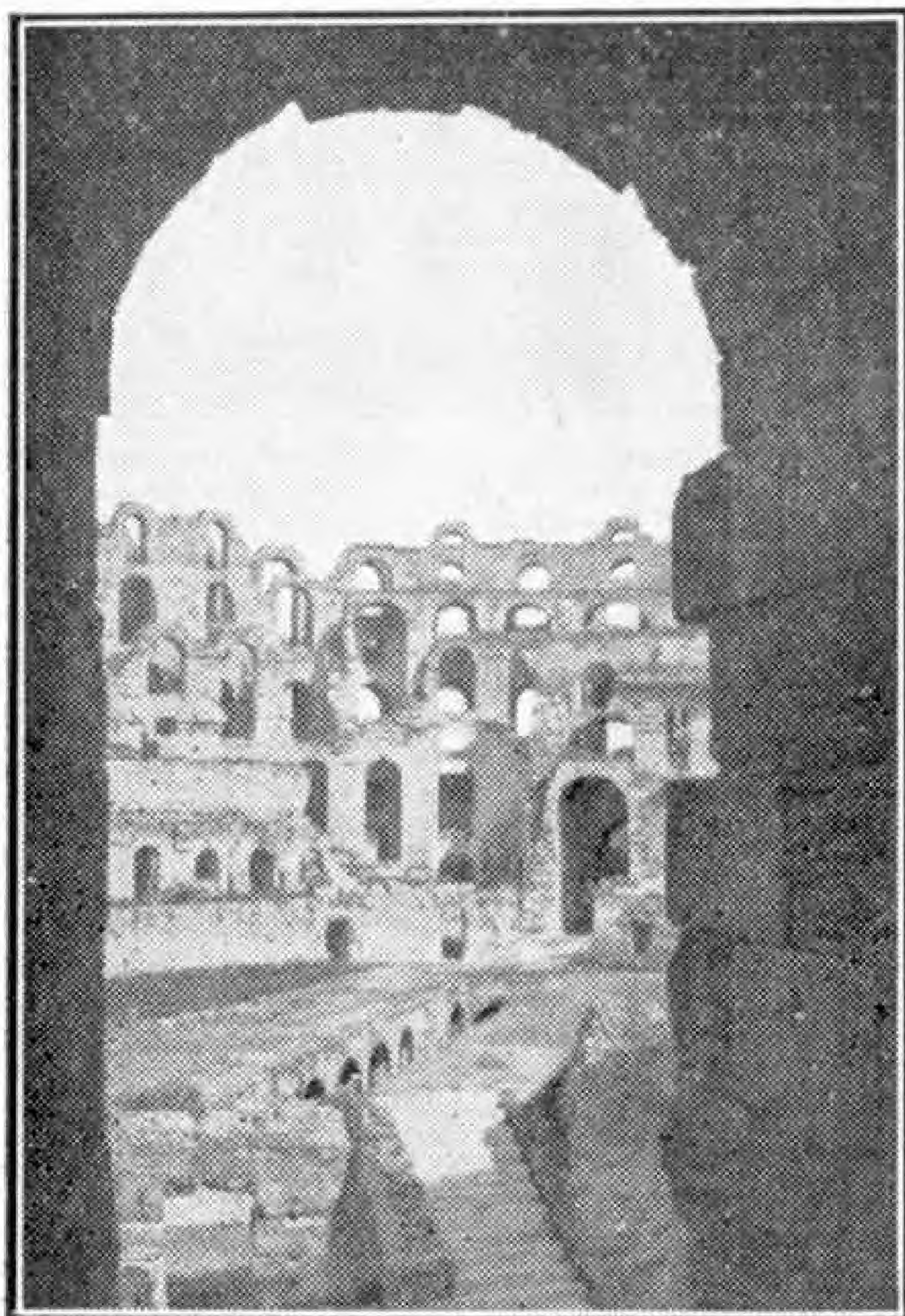
Whereas in Algiers the stranger may visit any of its mosques, in Tunis Europeans are strictly excluded from them. The charm about them is their lovely tiling. Just outside the city there is the Bardo Museum, simply crowded with art treasures dug up in all parts of the country. Almost in the centre of the city is the memorial column to John Howard Payne, author of the words of "*Home, Sweet Home*." It stands on what is really British soil. In 1645 the then Bey of Tunis gave a plot of ground in the city to the British Consul for a "Strangers' Burial Place," and ever since it has been British property.

Payne was the American ambassador in Tunis, and when he died he was buried in this little bit of British soil. On the simple monument are these words: "In the tomb beneath this stone, the poet's remains lay buried for thirty years. On January 5, 1883, they were disinterred and taken away to his native land where they received honoured and final burial in the City of Washington, June 9, 1883."

From Tunis one goes by electric tram or motor bus to the ruins of Carthage, believed by many scholars



In the native quarters of Tunis. The boy in the foreground is carrying charcoal.



Remains of the great Roman Amphitheatre at El Djem. It was 489 ft. long, four storeys high, and accommodated 60,000 spectators.

to be the Tarshish of the Bible, the place to which Jonah sailed when he had his adventure with the whale. Though archaeologists have been busy for the past decade and more excavating ancient Carthage, they have by no means learnt all its secrets. At El Djem, to-day a miserable Arab village, may be seen the ruins of the best preserved amphitheatre in the world, exceeded only in size by the Colosseum in Rome. It was 489 ft. long, had walls 66 ft. thick, stood four storeys high, and accommodated 60,000 spectators.

Farther along the coast from Carthage is the great French naval base of Bizerta. Its harbour is spacious enough to shelter the combined navies of the United Nations.

Every town and every village has its gate. There may be no wall around the village, but it has its gate, a crude archway perhaps with earthen seats on each side of the entrance way, where the men meet, sip coffee and discuss the latest news. It is the village club.

The most sacred place in Tunisia in the eyes of the Arabs is the holy city of Kairouan. The word means caravan or halting place. It was founded by the Arab conqueror Sidi Okba only 38 years after the death of the Prophet. It soon became the capital of the Arab empire in Africa and the most holy of all Mohammedan cities. Seven pilgrimages to Kairouan are regarded as meritorious as one to Mecca.

The city, which has a population of some 20,000 is surrounded by a wall 20 ft. high and pierced by five gates. Curiously enough, while you cannot enter any of the mosques in Tunis, you are at liberty to inspect any of the 23 at Kairouan. When France took over the country she insisted that the mosques of Kairouan should be open to Europeans. Dating back to the early centuries, many of the mosques are of great architectural and archaeological interest. In an enclosure near the Mosque of the Sword may be seen a number of old iron anchors with quaint Arabic inscriptions. The legend is that they were used by Noah to anchor the Ark!

Air News

The Latest "Spitfire"

Still another version of the world-famous "Spitfire" fighter is now on active service. It differs from the previous edition in having a slightly longer nose owing to being fitted with a bigger engine, the Rolls-Royce "Merlin" 61, and a 4-bladed airscrew instead of the 3-bladed one of the earlier machine. The leading edges of the wings are slightly straighter than hitherto, and there is a radiator attached to the underside of each wing. A shallow streamlined fuel tank to give greater range is fixed under the wing centre section, between the legs of the undercarriage. Dimensions and performance details are secret. This latest "Spitfire" is armed with two cannon and four machine guns.

Another version of the "Spitfire" has been in service with the Royal Navy for some time past. It is called the "Seafire," and is provided with a hinged deck arrester hook under the fuselage. When the machine lands on the deck of an aircraft carrier the hook engages one of the arrester cables stretched across the after part of the deck. Shock-absorbing gear allows the cable to expand, but the machine is quickly slowed to a stop.

Novel Hangar Doors

A novel type of aeroplane hangar door has been installed at a U.S. Army Air Forces flying school at Garner Field, Texas, U.S.A. The two huge 9-ton steel doors, one at each end of the 100-ft. wide hangar, extend its full width and are 20 ft. 6 in. high. They open by collapsing vertically into specially prepared trenches which are below floor level, and are 3 ft. 6 in. deep and 1 ft. 8 in. wide.

Each of these great doors is built up of a series of longitudinal sheet metal leaves 2 ft. 6 in. wide, which are stacked on each other as the door descends into the trench. When the door is fully dropped, a horizontal plate fixed to the top of it covers the trench and ensures a flush surface for the passage of aircraft. The doors are worked by a $7\frac{1}{2}$ h.p. electric motor through a link system, cable and winch.

New Airport at Lisbon

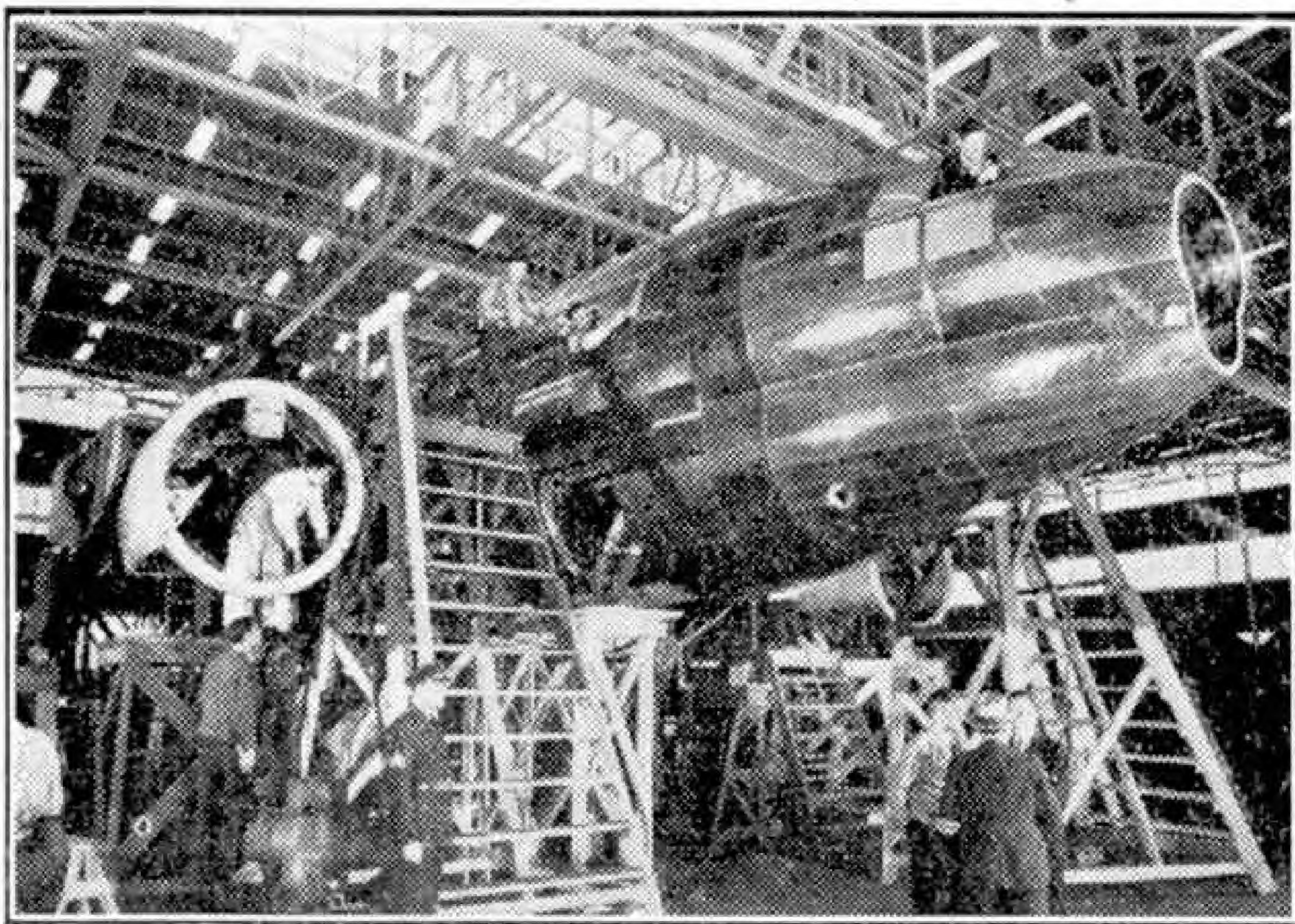
The new airport at Lisbon, Portugal, has been brought into use before its buildings are completed, owing to the inadequacy and inconvenient location of the aerodrome at Cintra, 18 miles from Lisbon, which landplanes have had to use hitherto. The new airport cost about £429,000, and each of its four intersecting runways is over $\frac{5}{8}$ ths of a mile long. It is only a few miles from the centre of the city, and can be reached by road much more easily than the Cintra aerodrome. It is also near the flying boat base at Cabo Ruivo, four miles up the River Tagus and on the north-east outskirts of Lisbon. This flying boat base was set up by Pan American Airways in 1939, and eventually is to be replaced by a modern, fully-equipped air-marine base.

British Airways operate an air service between Great Britain and Lisbon, and in September last year they opened new offices in the centre of the business quarter of the city.

A Veteran "Stirling"

"H for Harry" has broken all records for "Stirlings" flying on operations. This veteran aircraft has been on 62 raids, and has dropped over 500,000 lb. of bombs on enemy targets, and has shot down at least one fighter. It was intended to put "H for Harry" on the retired list, but its ground and flying crews begged for it to be kept on active service. They declared that it was as sound as the youngest "Stirling" straight from the production line. It was therefore tested, found remarkably reliable, and with a lower petrol consumption than any aircraft in the squadron; and it was decided to keep it in service.

Flight Sergeant A. M. Halkett, D.F.M., is the captain of this veteran "Stirling," and in his opinion it is the best machine that he has ever flown. True, he is only 20 years old and is the youngest member of his crew, but, starting with the 1,000 bomber raid on Cologne, he has been on many war flights over

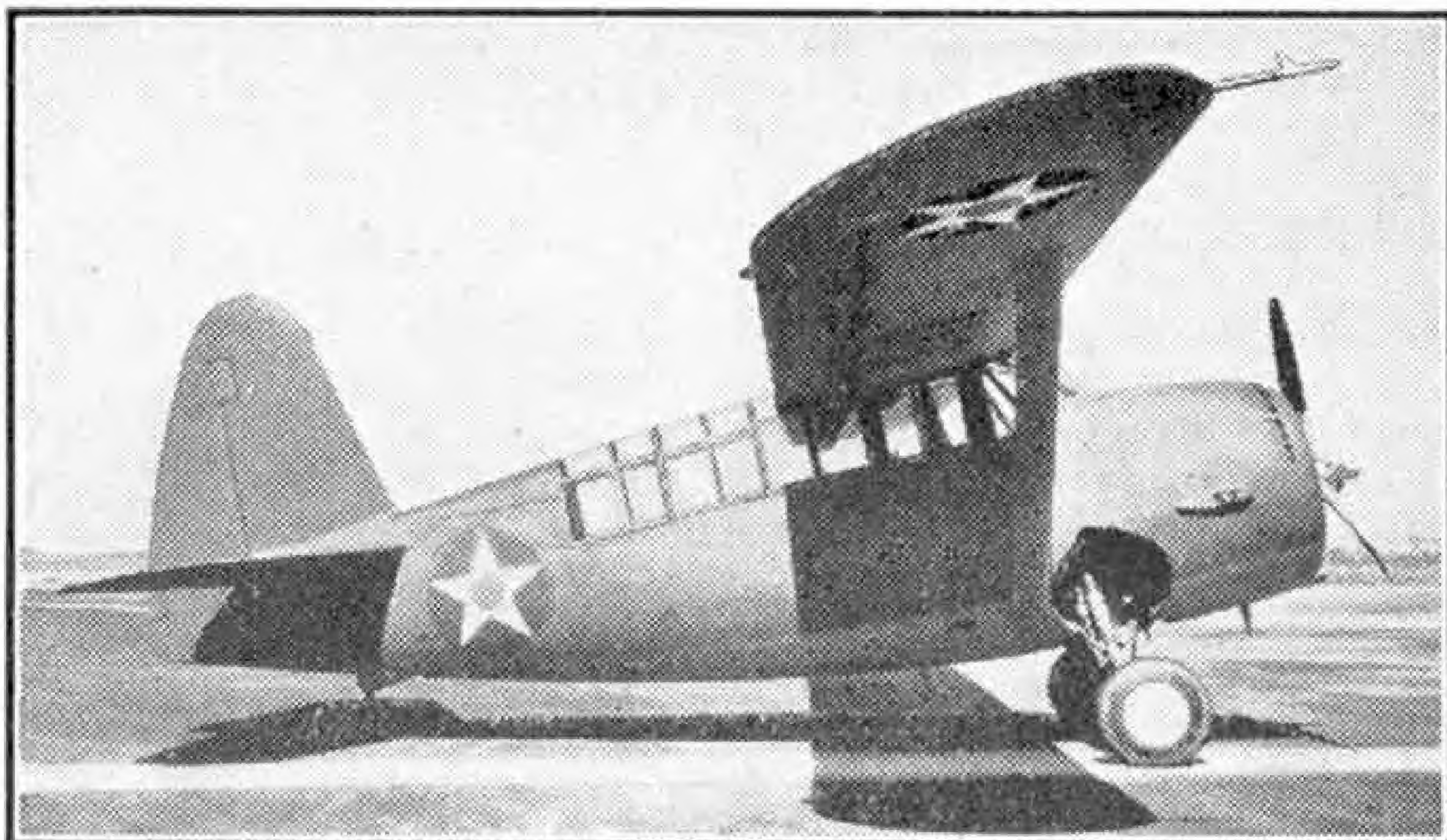


Curtiss C-46 "Commando" twin-engined troop transport under construction for the U.S. Army Air Forces. This photograph and the upper one on the next page are by courtesy of the Curtiss-Wright Corporation, U.S.A.

enemy territory. He believes in the luck of his aircraft no less than in its typical "Stirling" reliability. Only very occasionally has "H for Harry" been holed by "flak," and the biggest hole ever made looked merely as though someone had thrown a brick at the machine.

In addition to taking part in minelaying operations many hundreds of miles away from base, "Harry" has bombed objectives as far north as Flensburg and as far south as Genoa and Turin. Bombs from this machine have also fallen on Berlin, Hamburg, Wilhelmshaven, Cologne, Bremen, and the Ruhr or "Happy Valley" as the captain prefers to call it. During the 11 months that the German battleships "*Scharnhorst*" and "*Gneisenau*" were kept in the docks at Brest, "H for Harry" made several attacks on the ships. It was during a daylight attack on Brest that the bomber shot down a German fighter.

During a recent Empire broadcast on the pneumatic tyre, Sir George Beharrell, Chairman of Dunlop Rubber Co. Ltd., mentioned that each of the huge tyres made for the largest British bombers weighs 440 lb., or practically 4 cwt. At the other end of the scale he told of the single-tube racing tyre weighing only $4\frac{1}{2}$ oz. in production just before the war.



The Curtiss O-52 Observation monoplane. It can be used for reconnaissance, air photography, mapping, and coastal patrol duty.

A Curtiss Army Co-operation Aircraft

The Curtiss O-52, illustrated above, is being supplied in large numbers to the U.S. Army Air Forces for observation and Army Co-operation work. It is a high wing braced monoplane with a crew of two, pilot and observer. The cabin is large enough for air photographic reconnaissance work to be carried out comfortably, and the machine can be used for air mapping, as an artillery and troop spotter with an Army Co-operation unit, and for coastal patrol duty. The O-52 is not a combat machine, but it can take care of itself if attacked, as it is armed with machine guns. It is fitted with a Pratt and Whitney engine.

Aero Engines Help to Build Themselves

The power generated by aeroplane engines under test is being utilised in the production of similar engines at the new Ford plant at Ypsilanti, Michigan, U.S.A., where 2,000 h.p. Pratt and Whitney aero engines are in quantity production. When a completed engine is transferred from the assembly line to a testing cell, a hydraulic constant-speed coupling connected to a generator is attached to it, and power utilised that otherwise would be wasted. This practical method of saving fuel has already reduced the cost of producing the engines by 53 per cent.

"Lysander" on Mosquito Patrol

A Westland "Lysander," just clearing the telegraph poles, roars above the fringe of a long swamp that adjoins the Middle East aerodrome. A flood of greenish-yellow vapour pours from its fuselage, but the ground crew and aerodrome personnel do not take much notice. The "Lysander" is carrying out the "mosquito patrol," spraying the swamps and lakes with an oily substance that brings death to mosquito larvae and safety from malaria for the R.A.F. personnel. The mosquito patrol is one of the many measures taken by the R.A.F. in Egypt and the Middle East generally to keep its standard of health at the remarkably high level that has been maintained since the beginning of the war.

Scottish Airways' Winter Timetable

The winter timetable of Scottish Airways Ltd. includes a daily weekday air service between Glasgow and Stornoway, instead of the thrice-weekly one operated last winter. On this air route calls are made at Benbecula and North Uist on Mondays, Wednesdays, and Fridays, and after 20th February next the calls will be made every weekday. The Inverness-Kirkwall service is being flown three times a week, one of the trips also going on to the Shetlands; and there is a twice-weekly air service between Glasgow, Campbeltown, and Islay.

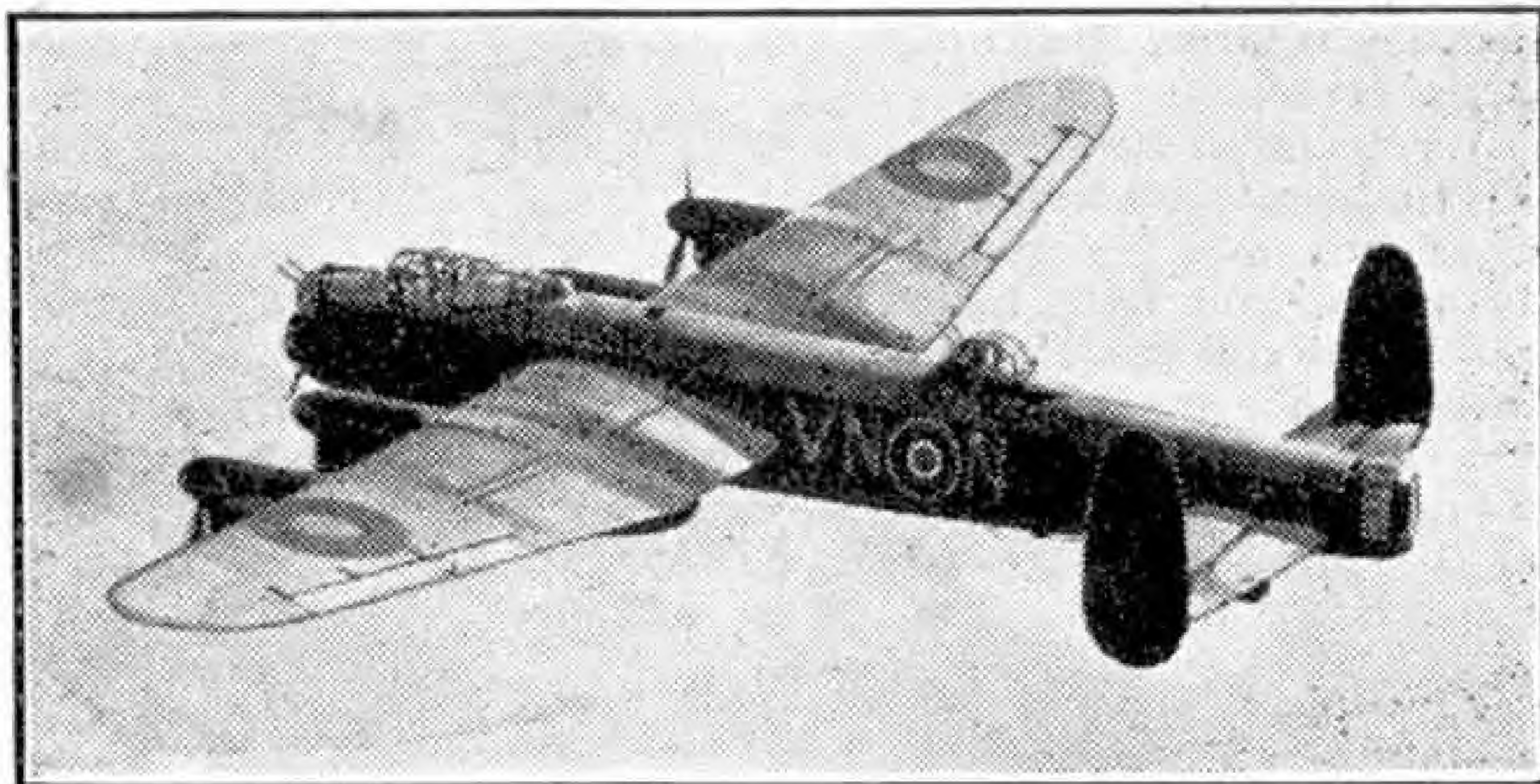
French-built Enemy Aircraft

Germany is making the French aircraft industry produce many German types of military aircraft. The machines include Junkers Ju 52 troop transports, Dornier Do 26 flying boats, Focke Wulf Fw 189 reconnaissance machines, and the Messerschmitt Me 109F fighter.

The Heinkel He 274, a new and at present experimental type, is also in production in France, and the first of these machines is expected to be completed a few months hence. It is said to have four 2,000 h.p. B.M.W. 802 engines, and a pair of undercarriages, one beneath each inboard engine.

Trainer Aircraft Built of Plastic-Bonded Plywood

A low wing monoplane built of plastic-bonded plywood has been produced by the Ryan Aeronautical Company, U.S.A. It is known at present as the Ryan PT-25, and the only part of its structure that is of



A fine flying view of an Avro "Lancaster" heavy bomber. Photograph by courtesy of "Flight."

metal is the engine cowling, a mere 2 per cent. of the whole. The PT-25 has a 185 h.p. Lycoming air-cooled engine, and is a two-seat, open cockpit machine.

It is reported from Detroit, U.S.A., that the Ford Motor Company are producing troop-carrying gliders by the assembly line method. The gliders have a wing span of 84 ft., and are large enough to carry 15 fully equipped soldiers.

Is Seeing Believing?

Some Interesting and Amusing Illusions

WHATEVER we are doing we depend very much upon our eyes. They guide us in walking down the street or across country, in weighing up obstacles in our path, and in judging distances. We



Fig. 1.

after all.

As an example take a look at Fig. 1. We almost immediately see that this is a silhouette in black of a vase of some kind, but if we make the look a long one we suddenly realise that it really shows two white human faces in profile! On shutting our eyes for a moment and looking again, the first impression returns. But which is the true one?

We have already pointed out that we rely very largely upon our eye for judging distances, and here too we can be very greatly deceived. In Fig. 2 there are three points marked A, B and C. It is easy to see that the distance from A to B is greater than that from B to C. At least, so we think to begin with, and we are surprised when the use of a measure



Fig. 2.

reveals the fact that B is exactly halfway between A and C. In this case it is the cunning introduction of the dots between A and C that has upset our sense of proportion, but there are other ways in which this can be done. Draw a horizontal line, and from its middle point draw a vertical line of equal length upward. Then

ask a friend to say which of the two lines is the longer, and without hesitation he will say that this is the vertical line.

One of the most prolific causes of illusion is the tendency of the eye to exaggerate the

size of anything that is white. Fig. 8, on the opposite page, has been specially prepared to illustrate this. The white square on the right undoubtedly seems larger than the black square on the left. Yet the two are exactly the same size, as the use of a ruler will prove.

Our eyes can deceive us very thoroughly in regard to direction as well as distance.

The best way to show this is to draw two parallel vertical lines. Across one of these, short lines sloping upward from the left are drawn, and similar short lines sloping in the opposite direction are drawn across the second. It is then found that the original lines appear to be far from parallel, the short lines confusing completely our sense

of direction as revealed by the eye. The effect is more impressive when the number of parallel lines is increased.

Even more interesting than these are illusions in which we find ourselves uncertain about the shape of things we see.

These are well illustrated by the very simple drawing seen in Fig. 3. This consists of a single continuous line, and the only enclosed space in it is right at the foot. Yet it requires a really



Fig. 4.



Fig. 3.

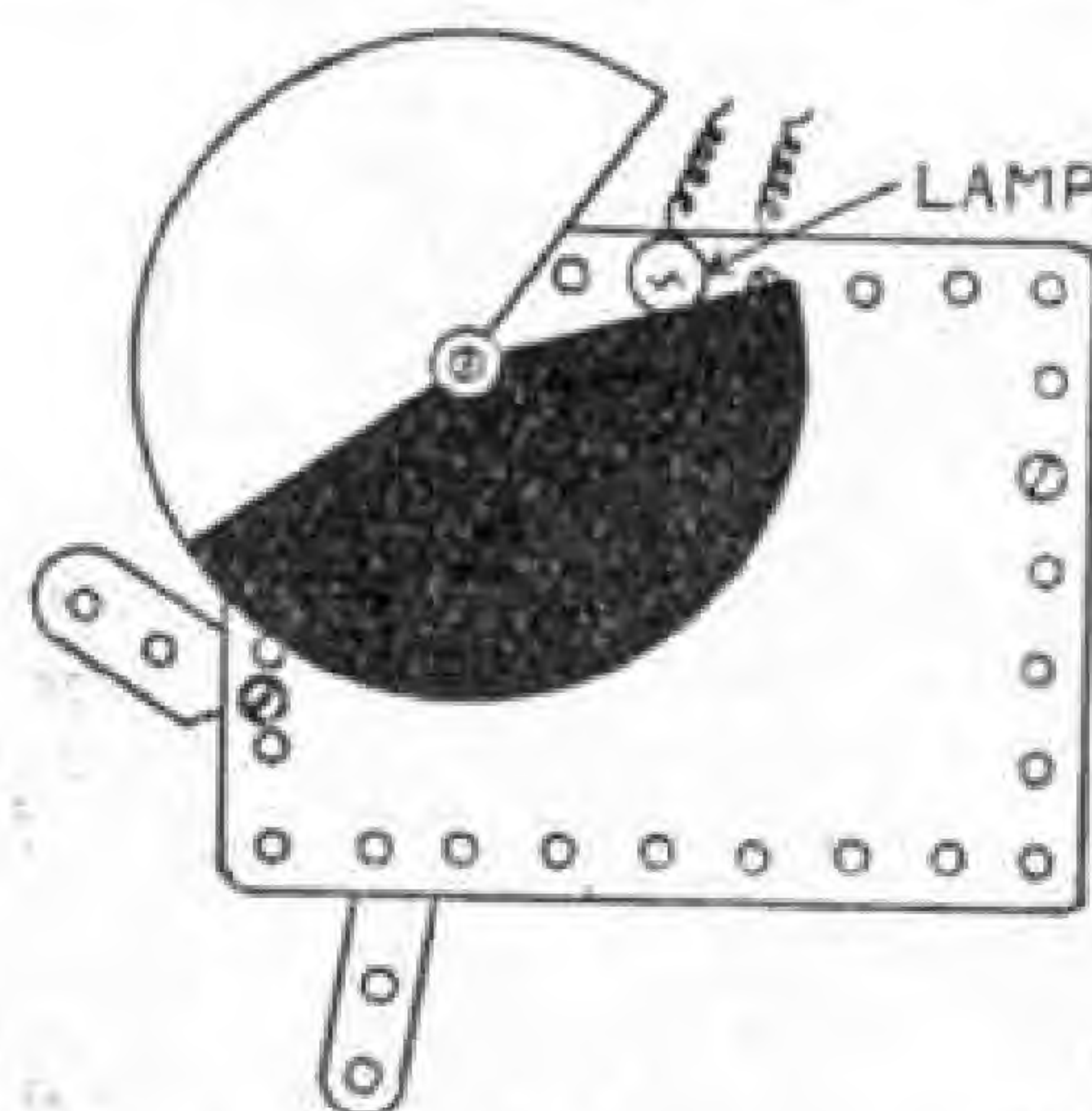


Fig. 5.

vigorous effect to see it as it really is; at most times it has the appearance of an inverted pyramid of long narrow rectangles.

A similar illusion follows examination of Fig. 9. Looking at this for the first time we are sure that it represents a flight of steps, but as we go on looking at it we find that it has suddenly turned upside down, solid stone or brick work and space changing places! These surprising steps too change backward and forward as we look at them, and it is very difficult, if not impossible, to compel them to take and retain either of the two forms they assume. This is characteristic of illusions of this kind; try as we will the figures turn over capriciously, and then change back again, as we look steadily at them.



Fig. 6.

will think that the light from a red lamp is green. This sounds impossible, but the reader can test it for himself very easily indeed. All that is necessary is that he should prepare a disc of white cardboard about 3 in. across, and cut out of it a small sector, as shown in Fig. 5. One half of the rest of the disc is blackened and the other half left white. The next step is to mount the disc on a spindle that can be rapidly rotated. In the figure it is shown fitted by means of a Bolt and Washer to a Threaded Coupling mounted on the spindle of a No. 2 Meccano Reversing Clockwork Motor, with the aid of which it can be rotated rapidly in either the clockwise or the counterclockwise direction. All that remains is to fix the red lamp in position behind the disc. A flashlamp



Fig. 7.

back again, as we look steadily at them.

There are times when we cannot believe our eyes as far as colours are concerned. For instance, it is quite an easy matter so to arrange things that a friend

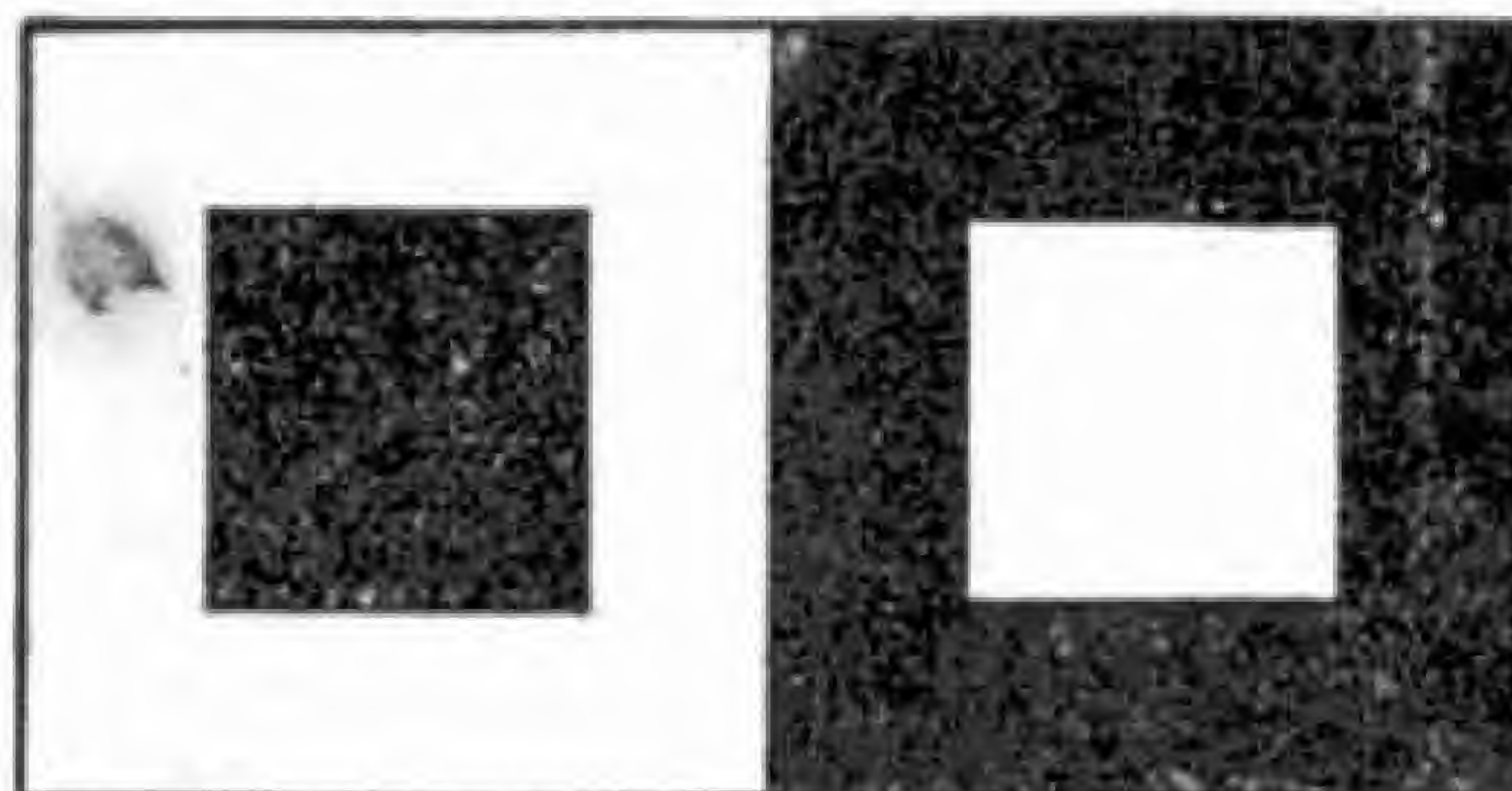


Fig. 8.

bulb is suitable, and Fig. 5 will suggest how it can be fitted with the aid of a Meccano Lamp Holder. It should be coloured with red paint or covered with red paper of a sufficiently deep colour to make the light from it really red, and not merely white light tinged red.

When the disc is spun in a clockwise direction the red lamp very surprisingly appears to be bright green. Reversing the motor, so that the direction of rotation is counterclockwise, restores the red light.

What causes the difference? This can only be the effect of white succeeding red in one case and black succeeding it in the other. When the rotation is clockwise, the eye sees the red lamp for a short period and retains the impression while seeing the white sector, with the result that the complementary colour green appears. This colour does not show up when the black sector follows the red. The best results are obtained when a good white light is directed on the face of the disc.

Other curious and interesting illusions can readily be demonstrated by similar methods. For instance, a second disc of white card is marked as shown in Fig. 4. Except for the wavy white line, which is continuous, the disc is blackened. A small hole is made in its centre so that it can be

balanced on a pencil point and spun slowly. As it turns the wavy line rolls round the card circle like a curious snake. Another instance is given by a card decorated in the manner shown in Fig. 6, with two large overlapping circles and a smaller one in the centre. When this card is spun on a pencil point the

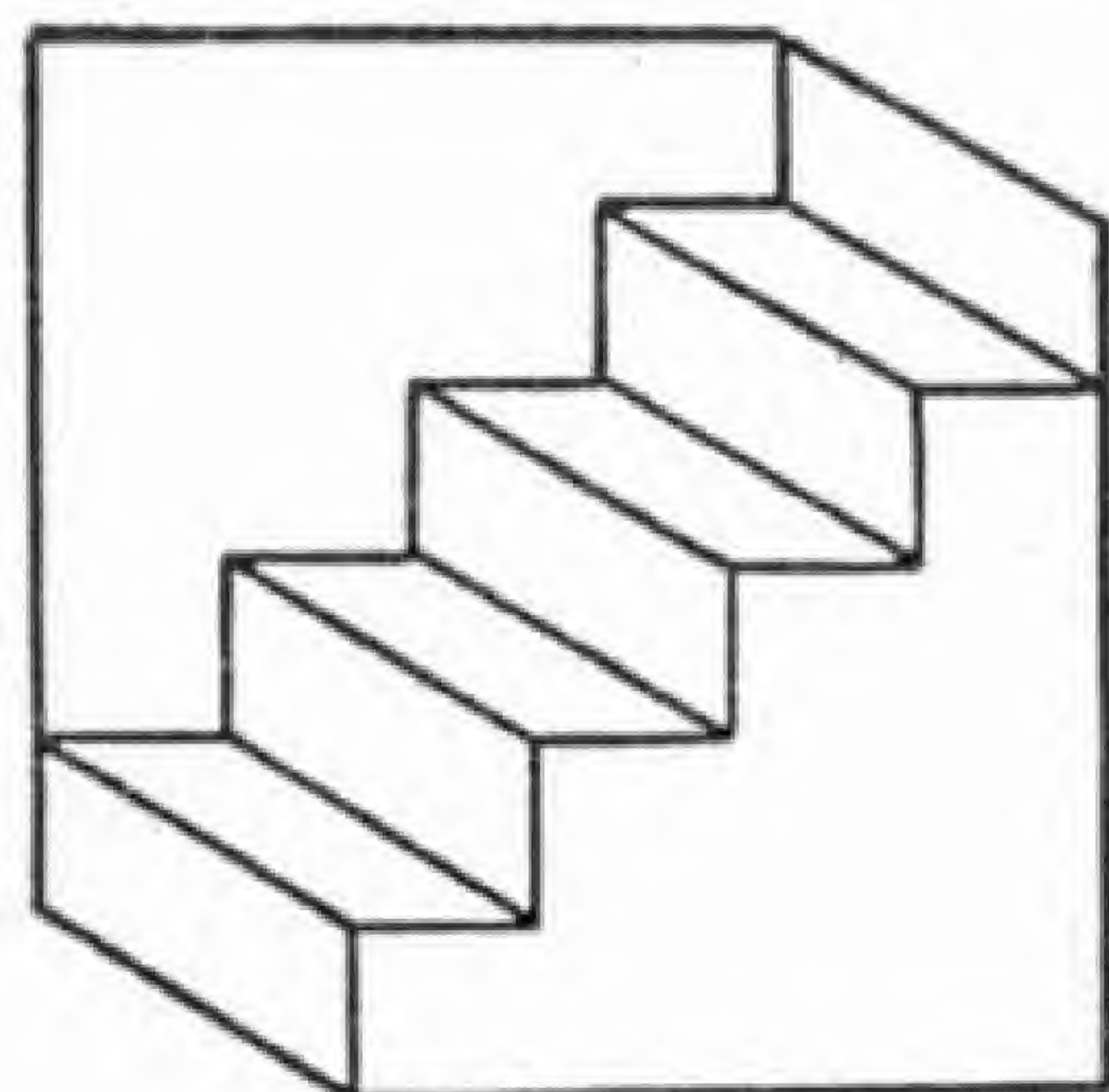


Fig. 9.

(Continued on page 34)

Railway News

Speedy Southern "Electrics"

Although there are probably few railway enthusiasts who derive as much interest from electric traction as from steam, even the most ardent of "steam" enthusiasts will surely admit that under war-time conditions the main line electrified services of the Southern Railway afford some of the liveliest running in the country. This is particularly the case in fairly short start-to-stop runs, where the electric train shows to great advantage by virtue of its superior acceleration in the initial stages.

Typical of such runs which may be experienced on the former L. & S.W. lines of the S.R. to-day is one noted recently by the writer on a 12-car Portsmouth-Waterloo express, which covered the 12.4 miles from Woking to Surbiton in the remarkable start-to-stop time of 12 min. 33 secs., or all but "even time." Down the 1 in 387 out of Woking speed rose to 70 m.p.h. in 3 miles from the start; the 1 in 330 rise past Weybridge was breasted at 67 m.p.h., and a final maximum of 75 was recorded on little easier than level grades before power was cut off for the stop.

On a journey in the reverse direction Guildford, 30.3 miles from Waterloo, was reached in 36 mins. start to stop despite severe signal checks out to Wimbledon, and the usual careful slowing through Woking Junction; with much coasting on downhill stretches maximum speed did not exceed 67 m.p.h. Some of the best running by the Portsmouth trains is made, however, in the climbs over the North Downs between Guildford and Haslemere and, northbound, between Havant and Haslemere. On a number of trips the minimum speed southbound up the $3\frac{1}{2}$ miles rising at 1 in 80 from Witley to Haslemere has been 47 m.p.h.

On the neighbouring Central Section lively running over the Downs is often recorded aboard electric expresses on the Victoria-Bognor and Victoria-Portsmouth routes; a notable example was a recent trip in an eight-car set, which ran the 13.5 miles from Horsham to Dorking North in 14 min. 42 secs. start to stop despite a climb of over five miles between Horsham and Holmwood, including nearly three miles at from 1 in 80 to 1 in 100, on which the minimum speed was 49 m.p.h. Thus Holmwood, 8.8 miles from the start, was passed in a fraction under 10 min., and on the ensuing sharp descent into Dorking speed rose to no less than 77 m.p.h. before power was cut off. Smart running of this character compensates for many of the difficulties of war-time railway travel. D. S. BARRIE.

The L.M.S. have run more than 50,000 special trains for the Fighting Services since the outbreak of war.

A Doncaster Coincidence

The 1942nd locomotive to be built at the Doncaster Works of the L.N.E.R. has just been completed. The works number plate fixed on the smoke box of the engine therefore has 1942 on it as the registration number and also as the year of completion, and it is extremely unlikely that such a coincidence can ever occur again.

The 1942nd engine has been allotted the number 3844 for service. It is one of a series of powerful 2-8-0 freight locomotives now under construction by the L.N.E.R.

Southern Locomotive News

During a short stay at Salisbury station recently, four of the "Merchant Navy" class 4-6-2 express engines were seen, working express and semi-fast trains over the West of England main line between Salisbury and Exeter, which is their chief sphere of operation. The last four, numbered 21C 7-10, are named respectively "Aberdeen and Commonwealth," "Orient," "Shaw Savill" and "Blue Star."

No. 614 of the "Jubilee" class of Drummond 0-4-2s, former London and South Western locomotives, was recently seen at Derby Midland station! Nos. 2089 and 2091, of the "13" type former London, Brighton and South Coast 4-4-2

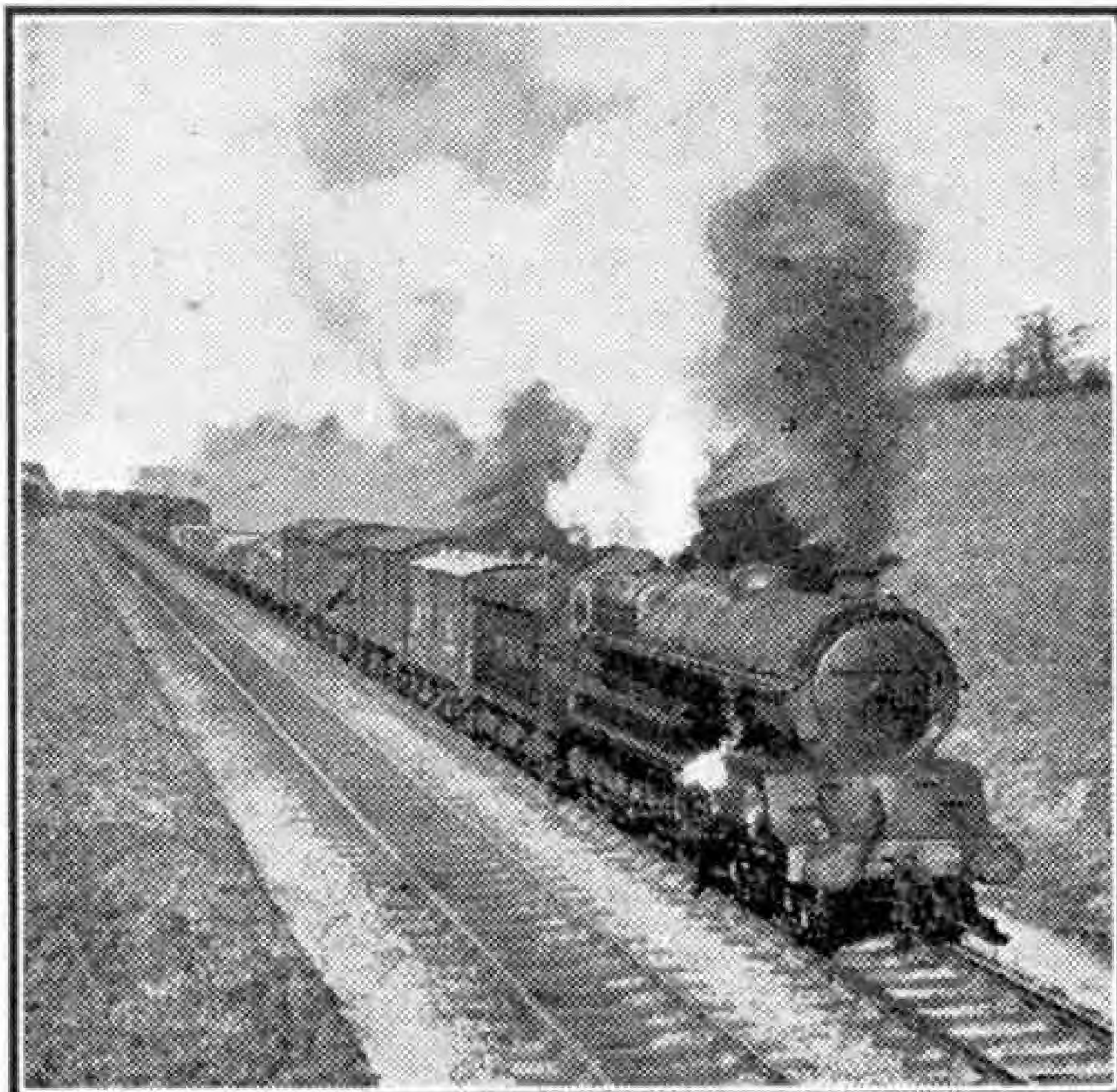
passenger tanks, which are on loan to the G.W.R., are frequently seen working between Worcester and Stourbridge.

It is reported that "King Arthur" class 4-6-0 express engines on loan to the Great Central section of the L.N.E.R. are working that Company's main line freight trains. The locomotives of all four groups, loaned or on normal duties, now traverse the G.W. and G.C. Joint line out of London via High Wycombe.

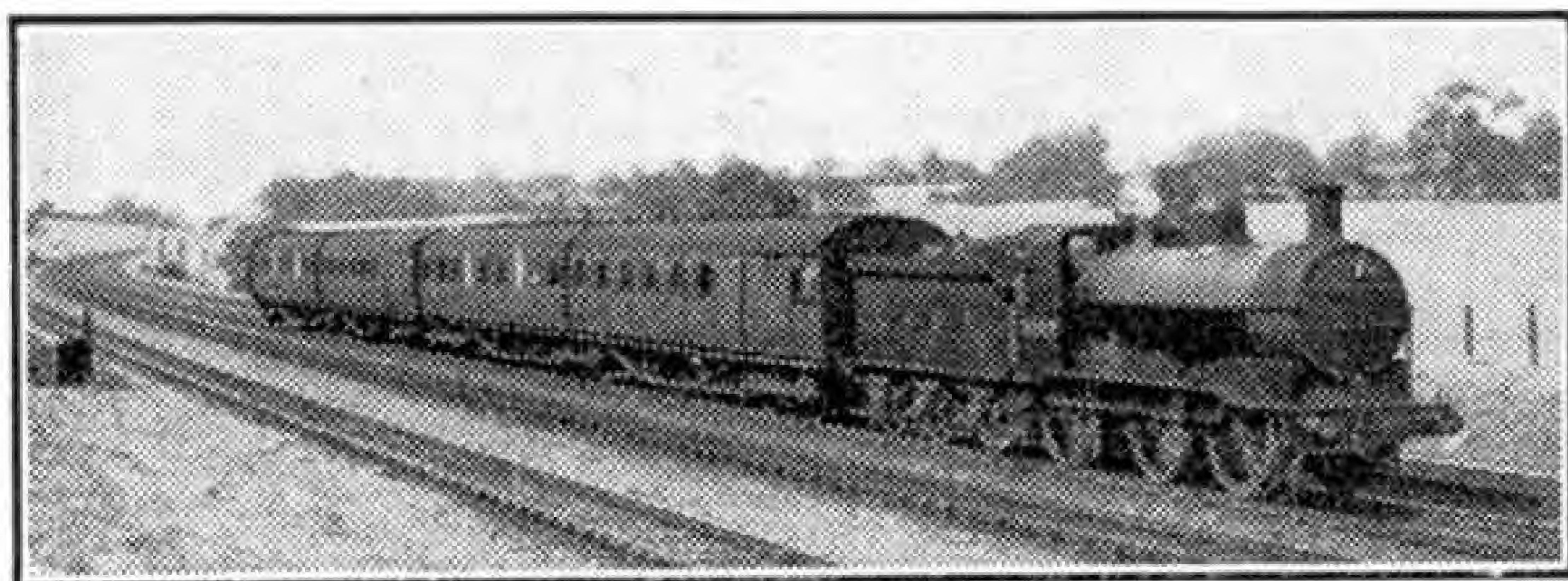
L.M.S. Notes

The "Turbomotive" 4-6-2 No. 6202, footplate runs on which were described in the October 1942 "M.M.," regularly worked the 8.30 a.m. Euston-Liverpool during the autumn. This is a very heavy train to Crewe. The engine returned to London the same day on the 5.25 p.m. express from Lime Street with a substantial load.

A correspondent writes that No. 6004, the last rebuilt "Claughton" class 4-6-0, has lately been stationed at Edge Hill and has been running frequently between Liverpool and Crewe. Stanier 2-8-0 freight engines built by private contractors and originally numbered 5xx and 6xx have in many cases been re-numbered into the standard 80xx series. "Silver Jubilee" class 3-cyl. 4-6-0s are often seen on fast passenger trains between Huddersfield and Manchester, also between Manchester and London via Stoke, among many other duties.



L.N.E.R. (G.C. Section) up goods train near Denham. The locomotive is No. 5458 of the "B7" 4-6-0 class. Photograph by C. R. L. Coles.



Hitchin-King's Cross train, headed by one of the ex-G.N. mixed traffic locomotives now forming the L.N.E.R. "J1" class. Photograph by Stewart Dewsbery.

The L.N.E.R. "J1" Class

News is to hand that some of the "J1" class 0-6-0 mixed traffic engines are now working on the Cheshire Lines and on the Great Central section of the L.N.E.R. One has also been seen passing through York. Previously they had been employed entirely on the former Great Northern lines, for which they were built at Doncaster to the designs of the late Mr. H. A. Ivatt in 1908 to work fast goods and excursion traffic, which was being developed rapidly at the time. They were numbered 1-15 and were known in their early days as the "New No. 1 class," the famous 1870 "eight-footer" No. 1, which reappeared on special trains in 1938, having by then been withdrawn from service.

The wheels are of the unusually large diameter for an 0-6-0 of 5 ft. 8 in. and, with cylinders and motion, are interchangeable with those of the G.N. "N1" type 0-6-2T. Before the introduction of the Gresley 2-6-0 designs, these 0-6-0s worked summer excursions from King's Cross to Skegness and back, 131 miles in each direction, with only one or two stops and hauling substantial loads with which they sometimes attained speeds of 70 m.p.h. They were used also on long-distance express freight trains as well as semi-fast passenger services. It is on the latter type of work that they have been mainly seen in recent years, especially in the West Riding of Yorkshire. They have not been superheated and are still almost exactly as built, being of sturdy appearance. Their present numbers are 3001-15.

The "J2" class, now numbered 3071-80, are similar engines, though fitted with a higher-pitched superheater boiler.

Locomotive Performance of the "Flying Scotsman"

The most notable recent phase in the long and progressive history of the 10.0 a.m. "Flying Scotsman" service between London and Edinburgh is the load carried, which is enormous even by modern East Coast standards.

The southbound train from Waverley is now allowed 8 hrs. 35 min. for the 392½ miles with four stops, which are always of much longer duration than in peacetime on account of the heavy traffic. This is decidedly faster than during the fourth year of the last great war, and it may be pointed out that in spite of an average increase in weight of approximately 35 per cent. the present running times are very little longer than those scheduled for many years up to 1932, although there is a present restriction on maximum speed to round about 60 m.p.h.

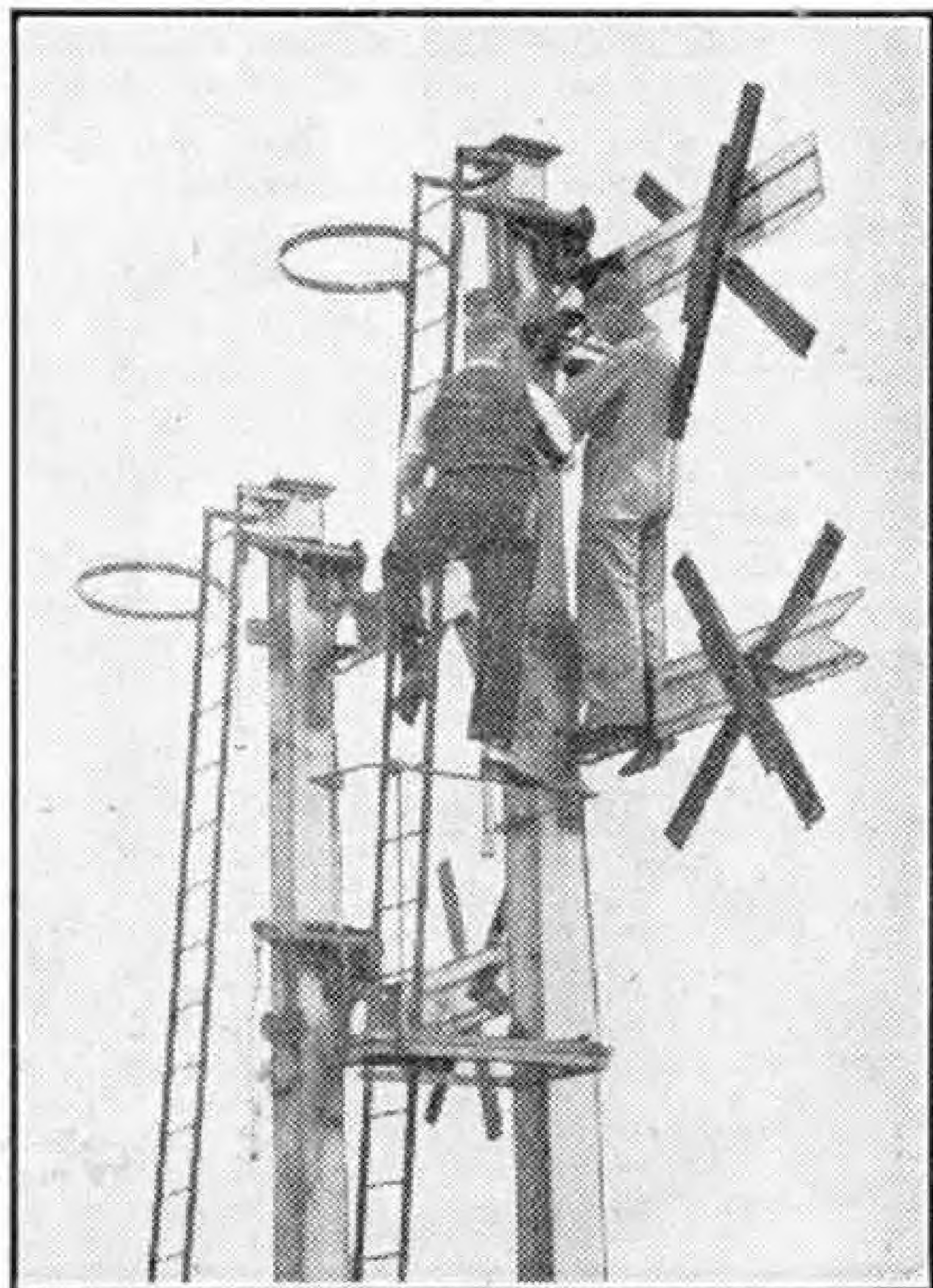
An up run that was recorded recently on a day when an extra stop was made at Dunbar showed a net gain of some 17 min. between Newcastle and King's Cross with a load of 18 crowded corridors and two well-filled steel vans, representing nearly 700 tons behind the tender. As far as Newcastle the train had 17 coaches weighing about 580 tons full. Hauling it up the long 1 in 96 of Cockburnspath bank and over the steep gradients of Northumberland was a stiff task for "Bayardo," one of the original Gresley "Pacifics" converted in 1926 to "A3" class with 220 lb. per sq. in. boiler pressure and retaining 20 in. cylinders, but time

was kept when allowance was made for the extra stop and 2½ min. overtime at Berwick.

With the load made up at Newcastle to the now usual 20 vehicles, No. 4886, a "Green Arrow" 2-6-2, put up a most competent performance right through to Grantham. South of Darlington she ran steadily at 60 m.p.h. or just over for many miles on the level, and in fact made up 8 min. during the 80½-mile run to York. The restart from York was 5 min. late. Time was regained on most stages on to Grantham, which was reached only 3 min. late despite a signal slowing outside Doncaster.

From Grantham to King's Cross the locomotive was a famous streamlined "Pacific" No. 2512 "Silver Fox," which in 1936 created a world record by attaining 113 m.p.h. in ordinary service hauling the "Silver Jubilee." It was necessary to draw up twice at Grantham in order to complete the station work, but even so the 10 min. allowed were not quite fully occupied so that the star was only 2½ min. behind time. By Hitchin the running had been so enterprising that the "Scotsman" passed through 4½ min. early, having made the excellent time of 28½ min. over the 27 miles, largely against the grade, from Huntingdon. The driver now took things easily over the varying gradients on to Potter's Bar, but a comparatively fast run followed down to the inner London area so that on passing Finsbury Park, 4 min. early, 97½ miles from Stoke summit had been covered in 106 min. at an average of 55.2 m.p.h., the usual Peterborough slowing included.

Notwithstanding the vast freight traffic, which has in many places to use the same tracks, only one signal delay had been experienced in 291 miles, but now a dead stop ensued, due probably to the enormous length of the previous up expresses, which like this one had to be divided in the terminus.



Railwaymen at work on new upper quadrant signals. Photograph by G. Thornton, Southport.

The Road Transport of Liquids

Aluminium Lightweight Tank Vehicles

ONE of the most interesting features of road transport during recent years has been the development of tank vehicles for the carrying of liquids of all kinds.

It is obviously more economical to distribute liquids in bulk than to carry them in a multitude of small containers but the provision of the necessary vehicles is by no means a simple matter. The suitability of the material of which the tanks are constructed is of primary importance, and in addition there are special problems connected with the handling of different liquids. Mechanically, the design of the tank is similar in each case, but every liquid has its special characteristics which must be taken into account. For instance, tanks for milk, beer and other drinkable liquids usually require insulation, and in order to avoid pockets in which bacteria might develop the corners must be of wide radius and all internal welds must be hammered smooth. Insulation is necessary also for tanks that carry tar and other liquids in which loss in temperature might result in solidification; while in conveying motor spirits fire risk must be guarded against. Filling by gravity is the rule in nearly all cases, but discharge may be by gravity, pressure or suction pump, according to the nature of the liquid and other special conditions.

The constructional materials most widely used for transport tanks are aluminium, stainless steel and mild steel, the last

occasionally being lined with lead or rubber for carrying acids. As compared with steel tanks, the aluminium type enables substantial savings in weight to be made. Sometimes the reduction in the gross load

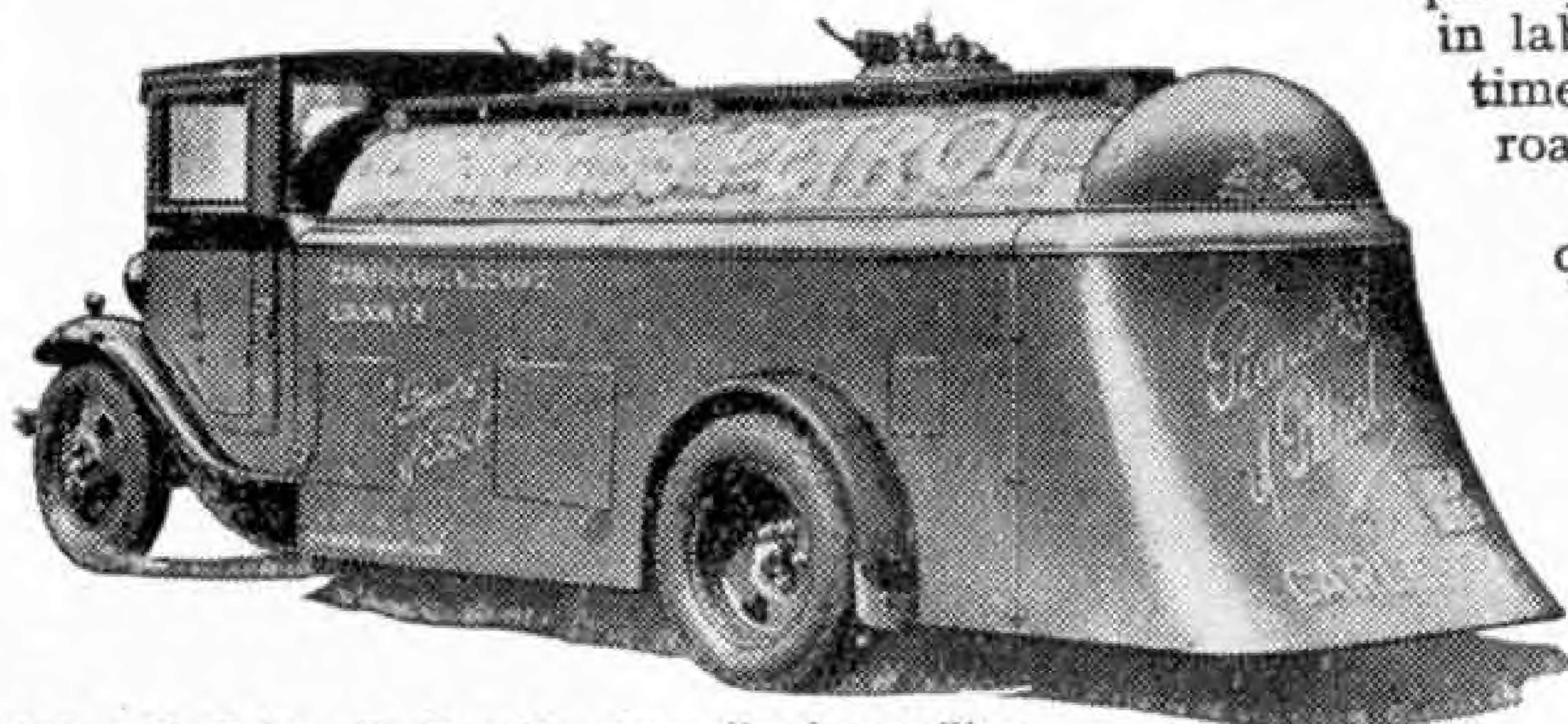


3,500 gall. Aluminium Tank for Vegetable Oil. The illustrations to this article are by courtesy of The Aluminium Plant and Vessel Co. Ltd.

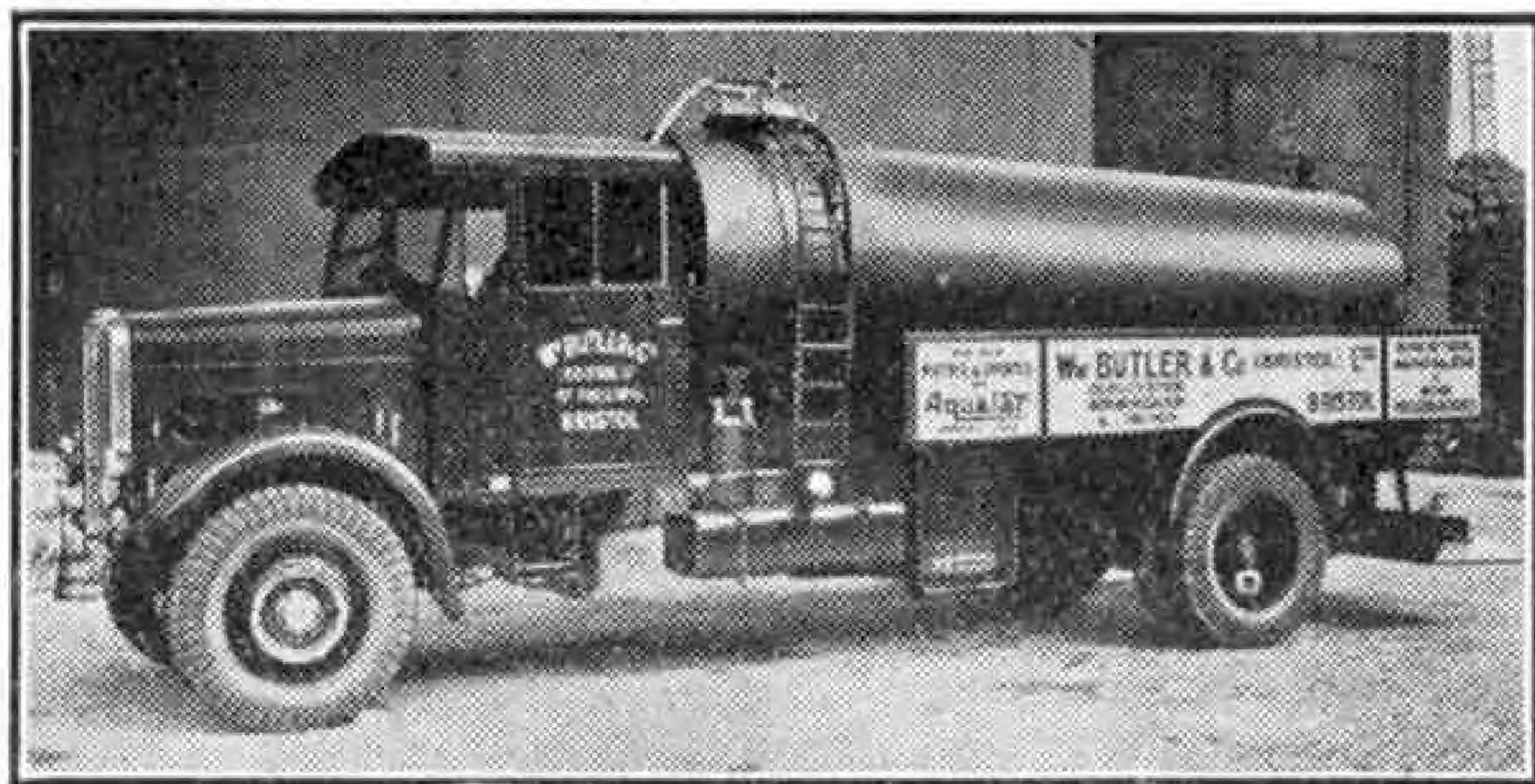
thus effected is sufficient to permit the use of a lighter and less expensive chassis, but more often advantage is taken of the weight-saving to increase the amount of liquid carried. On the basis of current practice in regard to tank thickness this gives an advantage to aluminium of about 10 per cent., the figure varying according to the specific gravity of the liquid. Thus a vehicle that carries, say, 2,500 gallons of a certain liquid in a steel tank will carry approximately 250 gallons extra in an aluminium tank. Some hauliers of milk, beer and vegetable oils show preference for tanks of stainless steel with brightly polished interiors. They are, of course, heavier and more costly than aluminium tanks but they can be cleaned and sterilised between loads rather more quickly, which results in a saving in labour and a reduction in the time the vehicle spends off the road.

Where insulation is required this often takes the form of "Alfol" (aluminium foil), arranged in layers of 2 in. or 3 in. according to conditions, and completely enclosed in a thin outer casing of aluminium.

While it is in the direction of increased



1,000 gall. Petro Tank with streamlined panelling.



1,000 gall. Tank for transport of Tar.

pay load that the great savings are made with aluminium tanks, the big demand for such tanks in Great Britain was given its impetus by the Finance Act of 1934. In this Act taxation on unladen weight was heavily increased, and the vehicle with an unladen weight of under 50 cwt. was given the advantage of an extra 10 m.p.h. over the legal limit of 20 m.p.h. imposed on heavier vehicles. The need to conserve light materials in wartime has brought about an amendment to this Act, extending the 30 m.p.h. limit to vehicles of 3 tons unladen weight.

A special type of mounting is employed for these lightweight aluminium tanks. The shell rests on bearers of light metal construction supported by brackets bolted to the chassis frame. The tank is held down to the bearers by straps of special aluminium alloy, which are provided with means of adjusting the tension. A special feature of the design is the connection between bearers and the brackets, which is elastic and allows of a considerable degree of movement vertically and in directions parallel to and at right angles to the chassis frame. The flexibility is achieved by "Silentblocs," which consist of a rubber bush compressed between two concentric steel sleeves. The outer sleeve fits in a boss on the bearer and the inner one carries a pin held in the fork of the bracket. Each bearer has two "Silentblocs," and their size is mathematically calculated in each case to suit the particular load and conditions. The function of the "Silentbloc" mounting is to insulate the tank from "hogging" and twisting of the chassis

frame, bumping loads and secondary vibrations, and it enables shells of very light thickness to be used with complete safety.

The great majority of these lightweight aluminium tanks are made by The Aluminium Plant and Vessel Co. Ltd., and supplied to distributors of lubricating oil, fuel oil, and motor spirit, but they are used also for milk, vegetable oils and other liquids.

Elliptical tanks are now practically universal for motor spirits, fuel oil, lubricating oil and kerosene. The shell is of elliptical cross-section to bring the centre of gravity as low as possible on the chassis, to give maximum stability during transit.

For the conveyance of motor spirit in Great Britain special precautions must be taken. The tanks must comply with the Petroleum-Spirit (Conveyance) Regulations 1932, which include restriction of the size of compartments to a maximum of 600 gallons, and the provision of certain fittings. Petrol tank thickness is not made the subject of regulations in this country as it is in the United States and Germany,



Fine six-wheeled vehicle for Beer transport.

but minimum thicknesses were fixed by a "gentlemen's agreement" in 1937 between the leading tank manufacturers.

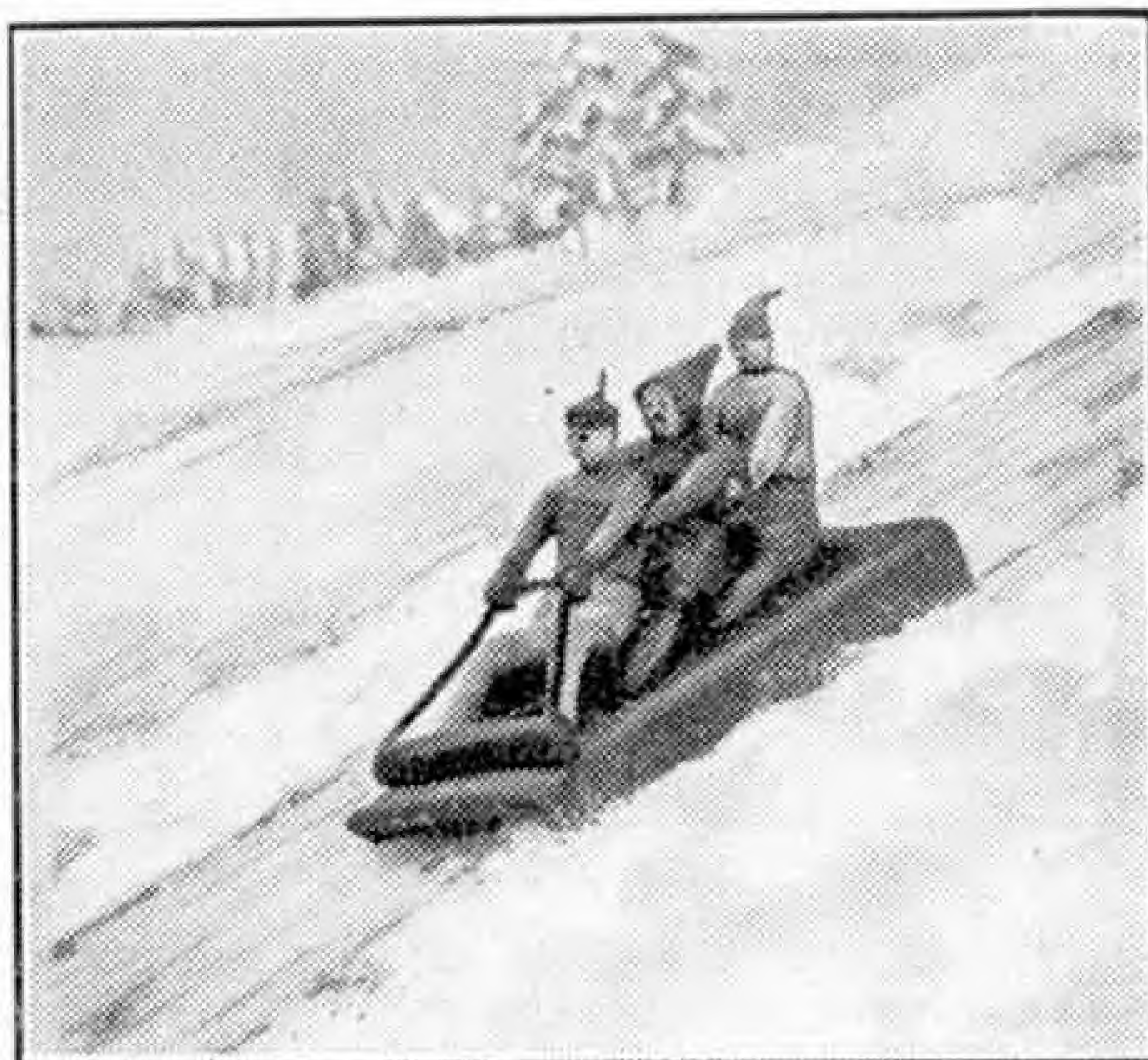
Where the discharge of the liquid is effected by pressure, as with milk, beer or tar, cylindrical tanks are almost always used, for to withstand the pressure without distortion an elliptical tank would have to be of considerable thickness. A point of importance where drinking liquids are carried is that the cylindrical shape simplifies cleaning operations.

Photography

Table-Top Pictures—III

WE bring our notes on table-top pictures to a conclusion this month with three more scenes.

In the two snow scenes, "*The Start*" and "*The Finish!*" the same background was used as for the scene "*Bringing Home the Christmas Log*" illustrated last month. The baseboard consisted of a piece of 3-ply wood 20 in. by 12 in., tilted at an angle to produce the necessary down-hill effect. Plasticine was used for the sledge and figures, the latter being built up around wire skeletons as described last month. The posing of the sledge and figures in the second picture presented some difficulty and several different arrangements were tried, and rejected,



The Start.

usual way. The elephant, the squirrel, the dog and the tiger were miniature figures from the domestic supply of oddities. There are infinite possibilities in this kind of picture. The fact that the result aimed at is humorous or grotesque makes it unnecessary to worry about the figures being out of scale with one another and with the scene as a whole.

We hope these three photographs will tempt many readers to try their hands at table-top pictures, and we shall be glad to see their results with a view to publication if suitable. Prints sent in should be accompanied by brief notes on the construction of the scene.



The Finish!

before the final "spill" effect was obtained. The snow on the baseboard was ordinary kitchen salt, which has been found to give most realistic results. Its surface was roughened to represent sledge marks.

The third scene required quite different treatment. Here a background was roughly sketched in to suggest a summer sunset. For the forest glade an assortment of privet, laurel and grasses provided the setting on which the various animals were posed. The giant mushroom and the dreaming reader holding on to it, very much scared, the tortoise on the mushroom, and the snake, were all made of Plasticine in the

THIS MONTH'S COVER.

This month's cover is based on a fine photograph by "*The Yorkshire Post*," which provides a striking example of how well the camera can render snow and sunshine.



"M.M." reader's dream after a visit to Whipsnade.

From Our Readers

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

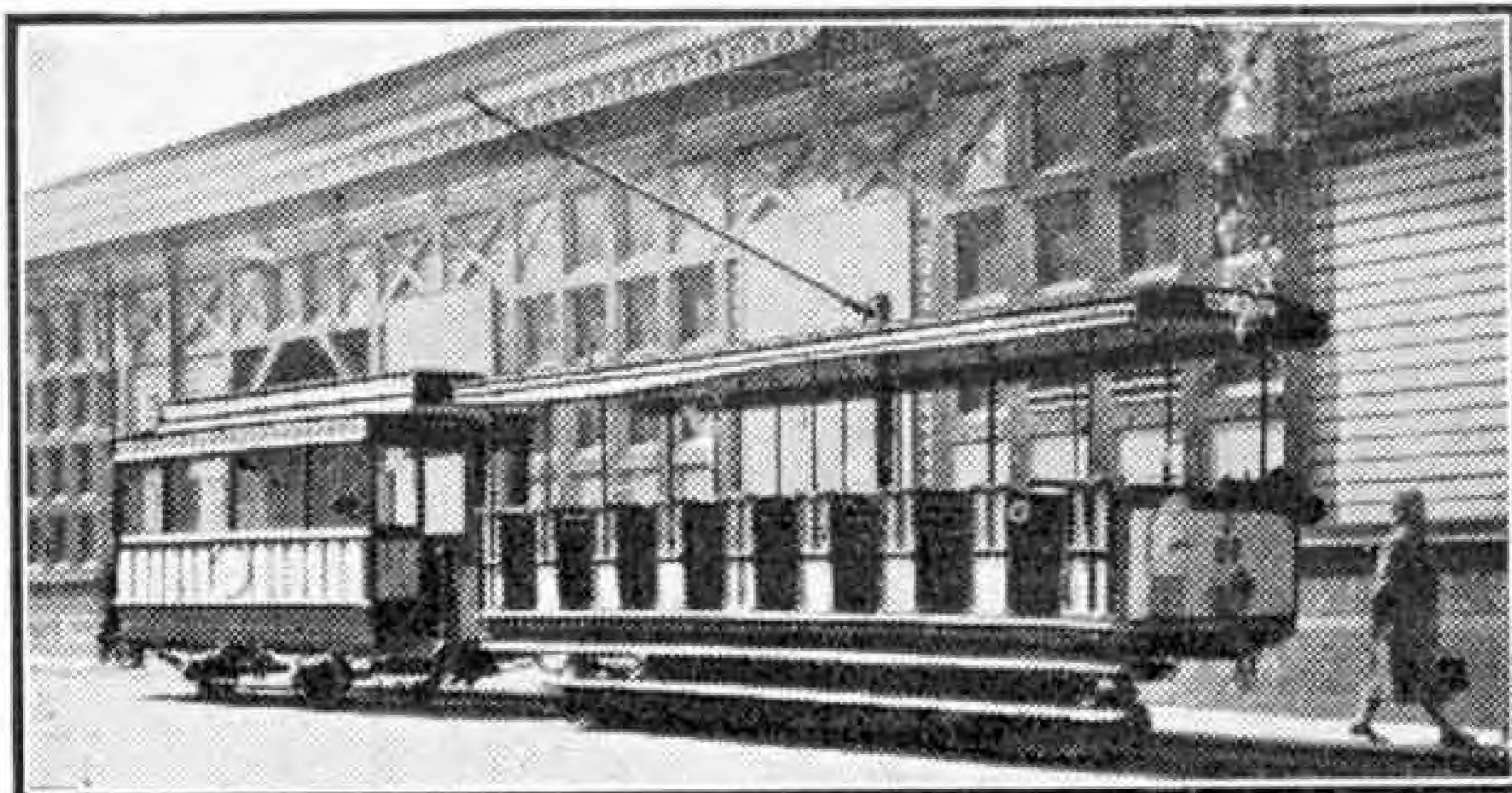
THE WORLD'S FIRST HYDRO-ELECTRIC TRAM

The first hydro-electric tramway in the world, and indeed one of the earliest electric tramways, still runs between Portrush and the Giant's Causeway. This tramway was constructed, to replace an earlier steam line on the same route, shortly after the Berlin Exhibition of 1881, at which an electric tramway was exhibited.

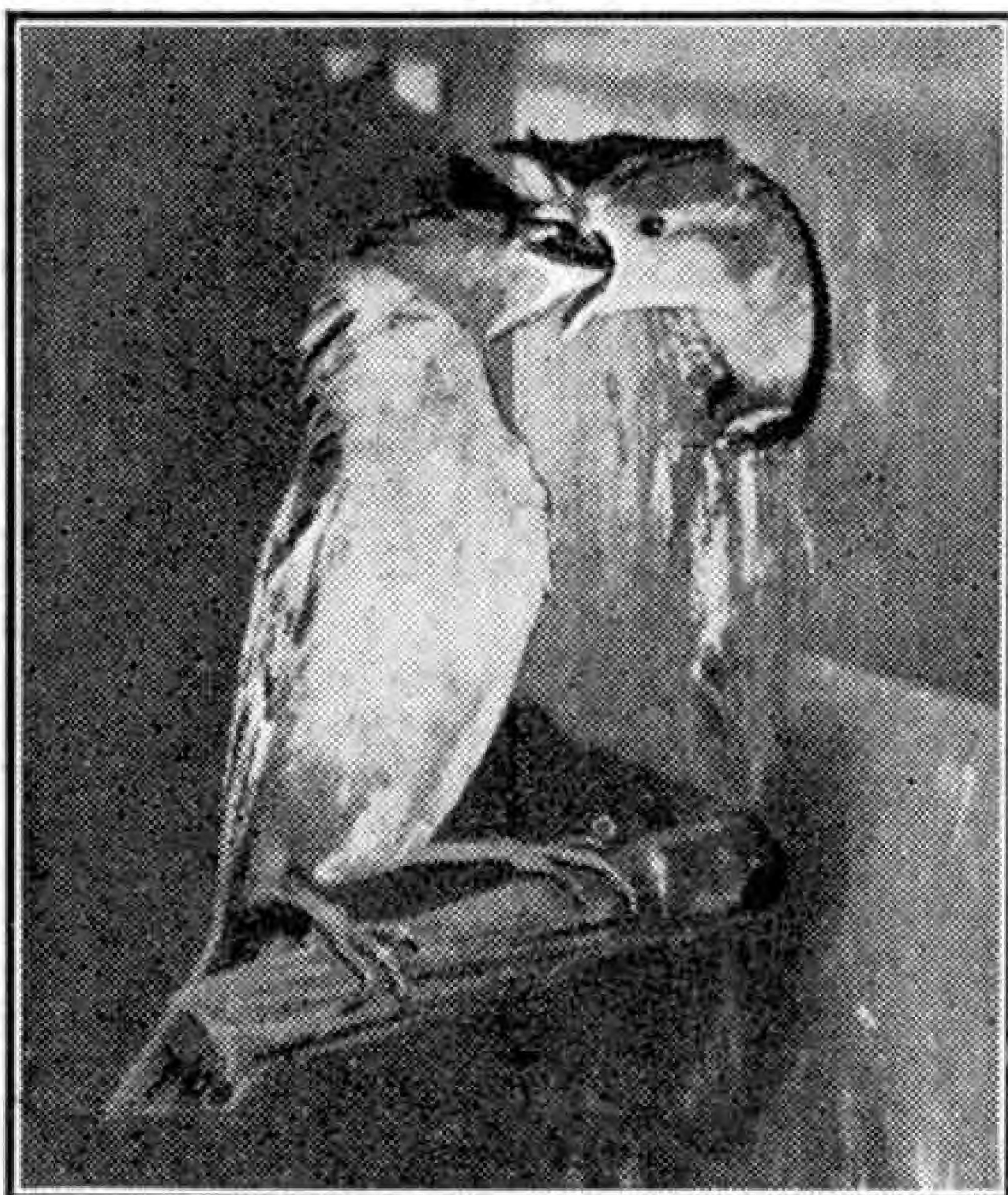
It is in all 8 miles in length, running from Portrush to Bushmills, and thence across open country to the famous Causeway. The accompanying illustration shows a tram at the starting point, at Portrush station. Power is gathered from overhead conductor wires similar to those in use to-day, but as our illustration shows, the cars are unlike the well-known city type. Two or three are run together; the first supplies the motive power, the others being trailers.

The cars now in use of course are not the originals but replicas. The line is single all the way except at passing places, where trams wait for one another. A signalling system is in use to show drivers when the line is clear. The tramway still generates its own hydro-electric power, the original station outside Bushmills being in use.

B. GILLESPIE (Portrush).



A tram at Portrush Station, about to start its run to Giant's Causeway, on the first hydro-electric railway. Photograph by B. Gillespie, Portrush.



Feeding a young sparrow hatched out in a tit's nesting box. Photograph by H. W. Dean, Purley.

A GARDEN PHOTOGRAPH

This photograph of birds was a lucky shot.

The nature lovers will notice that the birds are sparrows, and the moral is that when making a box for tits, the hole should be no more than an inch in

diameter, or other birds may use it. This hole was $1\frac{1}{2}$ in. across, and although tits nested in it the first year, the sparrows commandeered it in the winter months and nested in it last Spring.

Readers who are photographers will be interested to know that the photograph was taken with the aid of a spectacle lens of 20 in. focal length, a mirror and a reel of black thread. An ordinary folding camera was focused at infinity, the spectacle lens placed in front of the camera lens and the camera arranged at exactly 20 in. from the box. The thread was used to "fire" the camera from some distance away, and the mirror to reflect sunlight on to the birds so as to obtain stronger lighting. An exposure of $1/100$ th sec. was then sufficient.

H. W. DEAN (Purley).

CANNING PLUMS AND PEAS

While camping in Cambridgeshire I visited a canning factory with other boys. Plums were being canned when we arrived at the factory. As the tins were carried along a belt the plums were put in them and covered with syrup, which almost filled the cans. These were transferred to a second endless belt that conveyed them to a machine in which a lid was pressed on them. They went into a tank, where they were heated by steam, after which they were cooled, labelled and packed in strong cardboard boxes.

Pea-canning was over at the time of our visit, but our guide showed us the machines and described the processes. The peas are first placed in a "threshing" machine, which literally knocks the peas out of their pods. They are taken up an elevator to a washing machine, where they are swirled round in a cylinder of pure water. They pass to a "grading" machine, where rotating wire cylinders of varying mesh sort them into five different groups, according to size. Then they travel down slow moving belts, where the bad ones are picked out by hand. After this they are canned, labelled, and packed.

A. R. G. BURROW (Bournemouth).

Suggestions Section

By "Spanner"

(579) Bicycle-Type Free-Wheel (“Spanner”)

The Meccano Gear Ring, Part No. 180, has many uses, and one of the most interesting is illustrated in Fig. 579, where it is used to provide a ratchet wheel for a bicycle-type free-wheel. In this device the Gear Ring is fitted to a 4" Circular Plate, mounted freely, by means of two Bush Wheels bolted at each side of it, on a Rod on which the road wheel also is mounted. The Gear Ring is spaced from the Plate by four Washers on each Bolt.

The pawls consist of two Pendulum Connections, which are fixed to the road wheel in the positions shown by means of two $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets. They engage the inside teeth of the Gear Ring. The drive is connected to the free-wheel through a Pinion engaging the outer teeth of the Gear Ring.

(580) Universal Coupling (J. Richards, Portsmouth)

There are many occasions in engineering

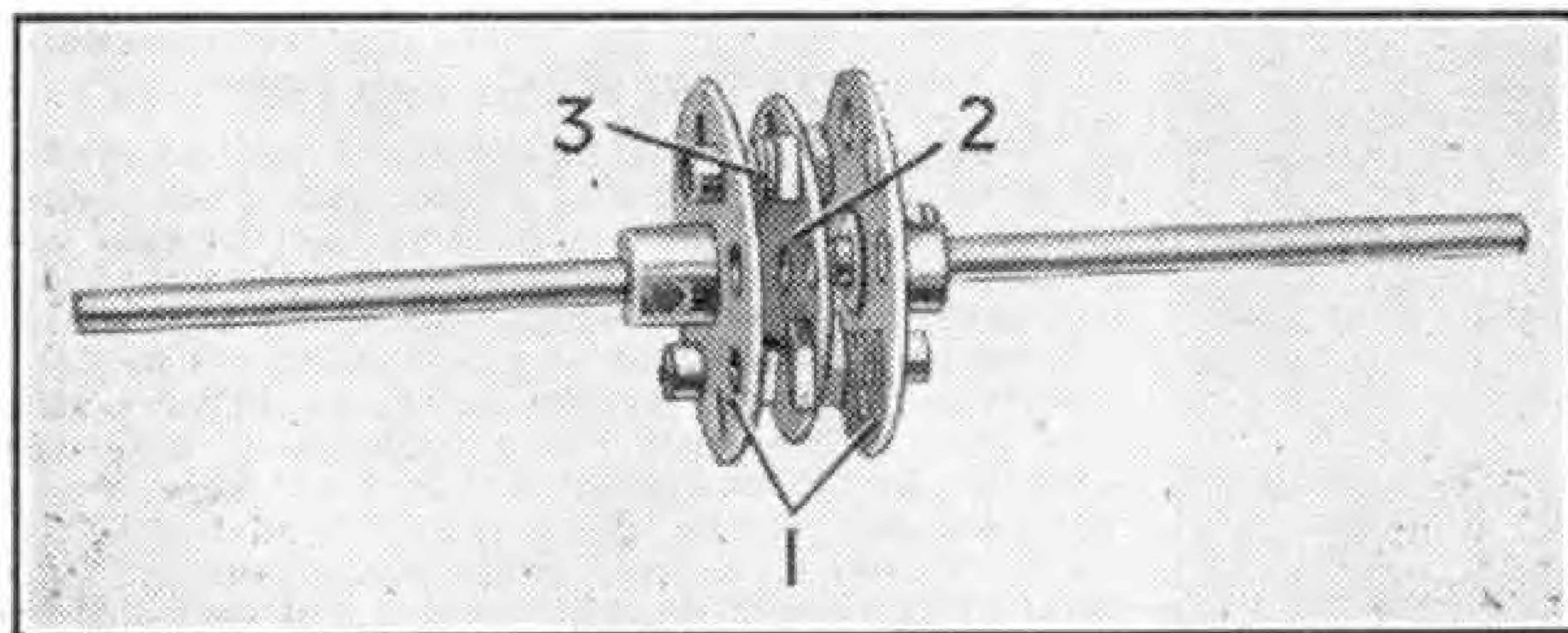


Fig. 580.

practice when one shaft is required to drive another that is out-of-line with it. A universal coupling then provides the connecting link. A common everyday use of such a mechanism is found in the transmission drive from the back of the

gear-box to the rear axle of a motor vehicle travelling over a bump in the road surface.

A reproduction in Meccano of such a coupling unit is shown in Fig. 580. The two Rods to which it is applied are fitted

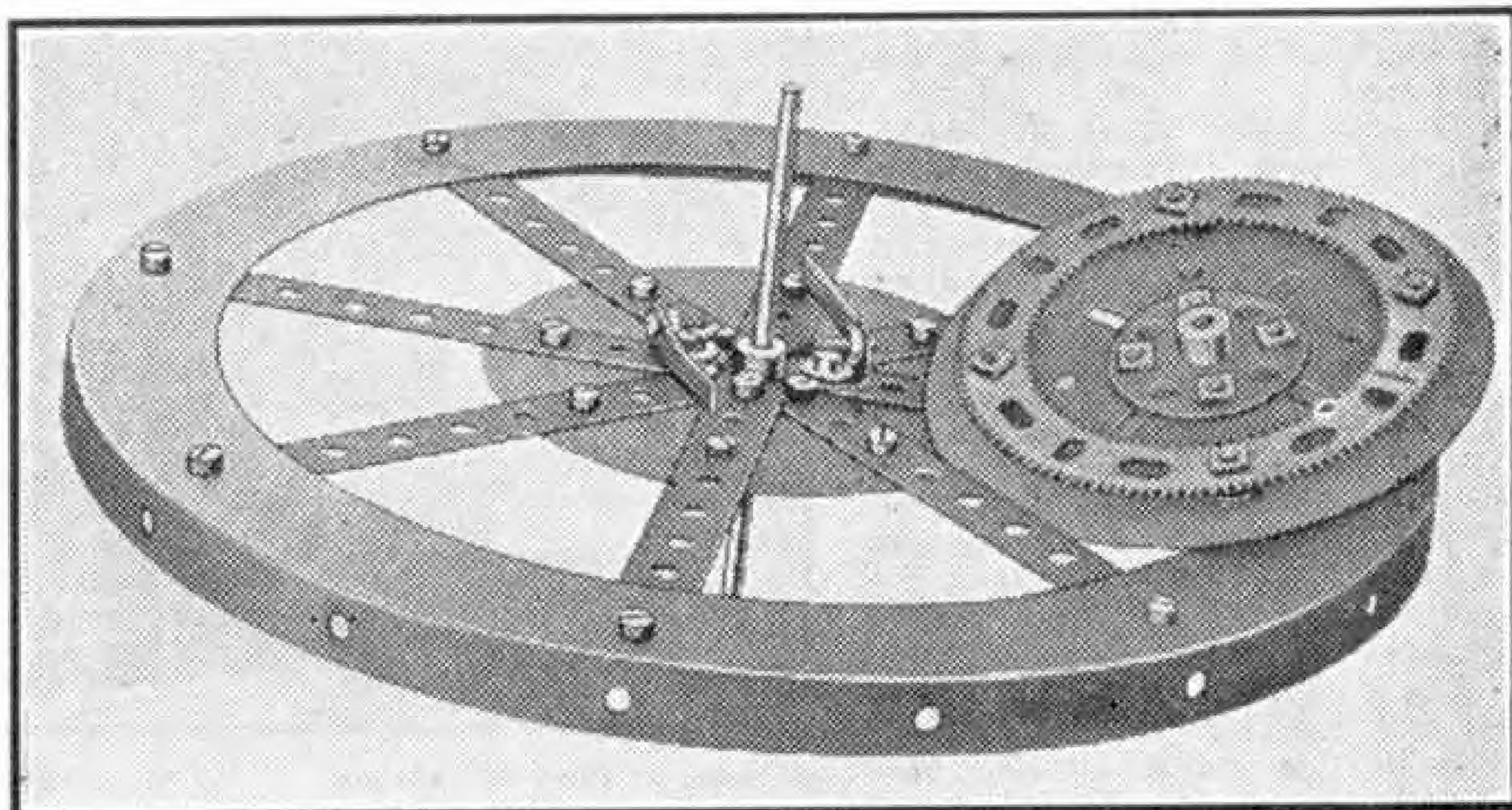


Fig. 579.

at their inner ends with Bush Wheels 1. A $1\frac{1}{4}"$ Disc 2 forms the central "spider," and is connected to the Bush Wheels by four $\frac{3}{8}"$ Bolts, two to each, so arranged that the Bolts passing through one Bush Wheel alternate with those passing through the other. Each of the $\frac{3}{8}"$ Bolts used is fitted with a small portion of a Compression Spring 3, its shank being locked by two Nuts to the $1\frac{1}{4}"$ Disc.

(581) Room Indicator (R. Thomson, Glasgow)

Fig. 581 shows an oscillating type of room indicator for an electric bell service. In this a suspended disc is made to swing to and fro by the action of a solenoid that becomes energised immediately when a push-button switch is pressed

in another room. There is a separate solenoid and disc for each room, and each is suitably labelled or numbered.

In the model each disc unit consists of a $1\frac{1}{4}"$ Disc 1 bolted to a $1\frac{1}{2}"$ Strip suspended on a Scientific Hook 2, Part No. 57a, which

is secured by a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket to the top of a box that is constructed from Flat Plates and Angle Girders. The disc is deflected by a solenoid 3 consisting of a Bobbin fully wound with 26 S.W.G. Wire. The Bobbin is fitted with a core

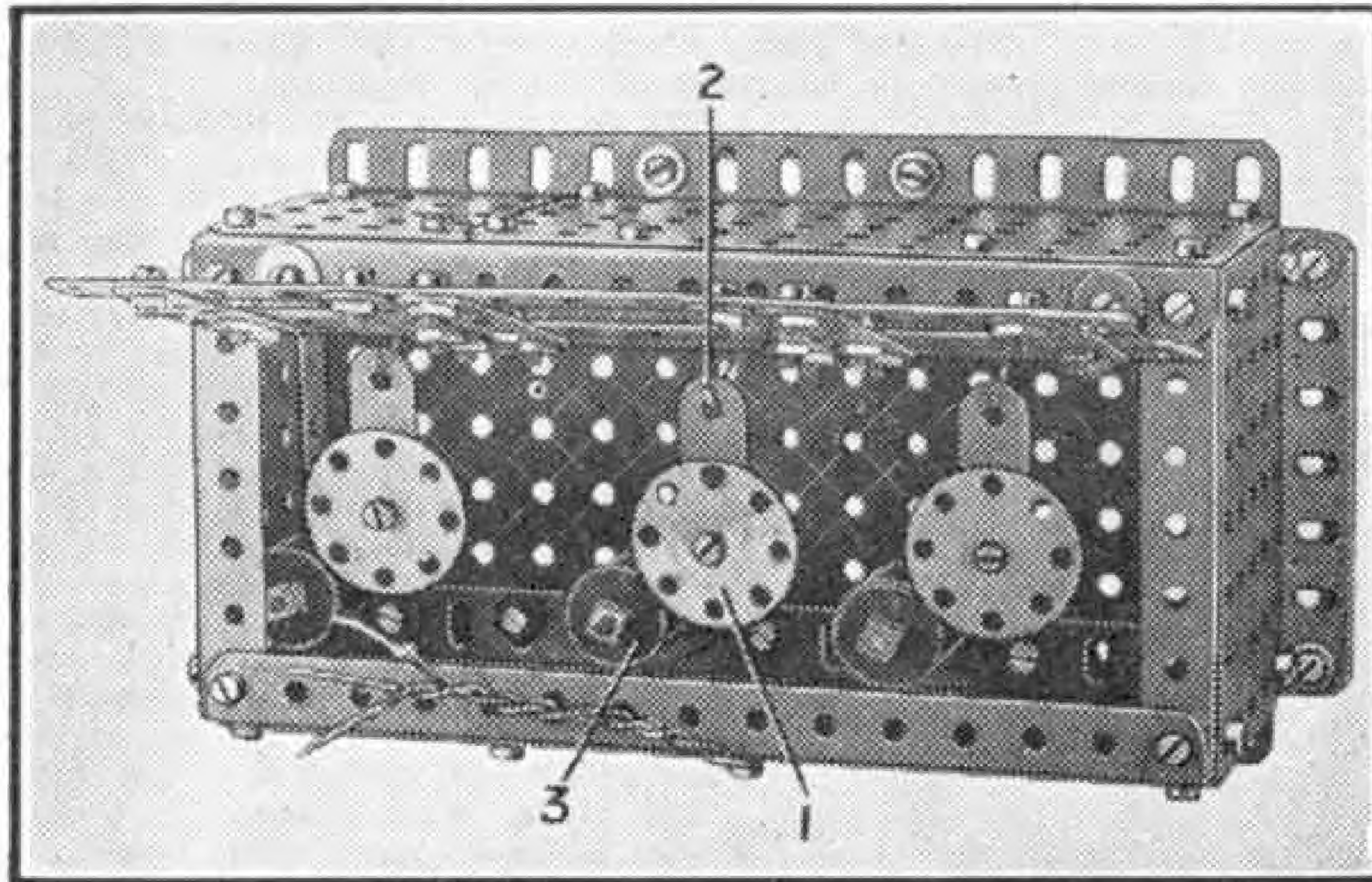


Fig. 581.

formed from a 2" Screwed Rod, fitted at its front end with several Nuts and locked at its rear end to a 1" Triangular Plate bolted to an Angle Girder at the back of the box. How the solenoids and discs are fitted in the box is shown in the illustration.

A front is provided for the box by Strips of various lengths, which are bolted together so that spaces are left through which the discs can be seen. The pairs of leads from each solenoid are connected to an electric bell that may be fitted inside or near the box, and thence to the bell pushes in the various rooms for which the indicator is required. Alternatively one lead of each solenoid may be earthed, to the frame of the model, and the other lead of each pair may then be connected to the bell and to the correct bell push, to which a wire from the frame of the model also is connected. This arrangement is seen in the illustration, which shows three such discs united. It should not be difficult to extend the model to accommodate as many such units as required.

(582) Compact Reduction Gear ("Spanner")

A special Instructions Manual, known as the Meccano "*Standard Mechanisms*" Manual is available to assist model-builders to base their models on correct engineering principles. In this Manual a large number of mechanisms that can be applied to many different kinds of models

is described and illustrated. A typical example of these devices is the compact reduction gear shown in Fig. 582 on this page, and full details of the Manual itself appear in the advertisement on page v.

Referring to Fig. 582 Rod 1 carries a fixed Pinion 3 that engages a 57-teeth Gear mounted loosely on Rod 2. The Gear is provided with two Bolts, the shanks of which are arranged on each side of the $\frac{3}{8}''$ Bolt 4. This Bolt is inserted in the boss of a $\frac{1}{2}''$ Pinion, but a Nut prevents it from gripping the Rod. In this way, the Gear and Pinion rotate freely on the Rod as one unit. The Pinion engages a second 57-teeth Gear coupled in a similar manner to another $\frac{1}{2}''$ Pinion. The final Gear 5 is fixed on its Rod, and a glance at the illustration will show that the drive can be taken from

either end of the Rod 2. Similarly the Rod 1 can be driven from whichever end is more convenient in the model.

(583) Automatic Brake for Model Cars (R. Wilson, Sunderland)

A novel brake that will apply the brake shoes of a model car to their drums automatically when the vehicle runs downhill can easily be arranged in the following manner. A weighted lever or pendulum is mounted in the chassis of the model in such a way that it swings forward when the vehicle runs down a slope, and in doing so closes an electric circuit that feeds current to two solenoids that actuate the brake shoes.

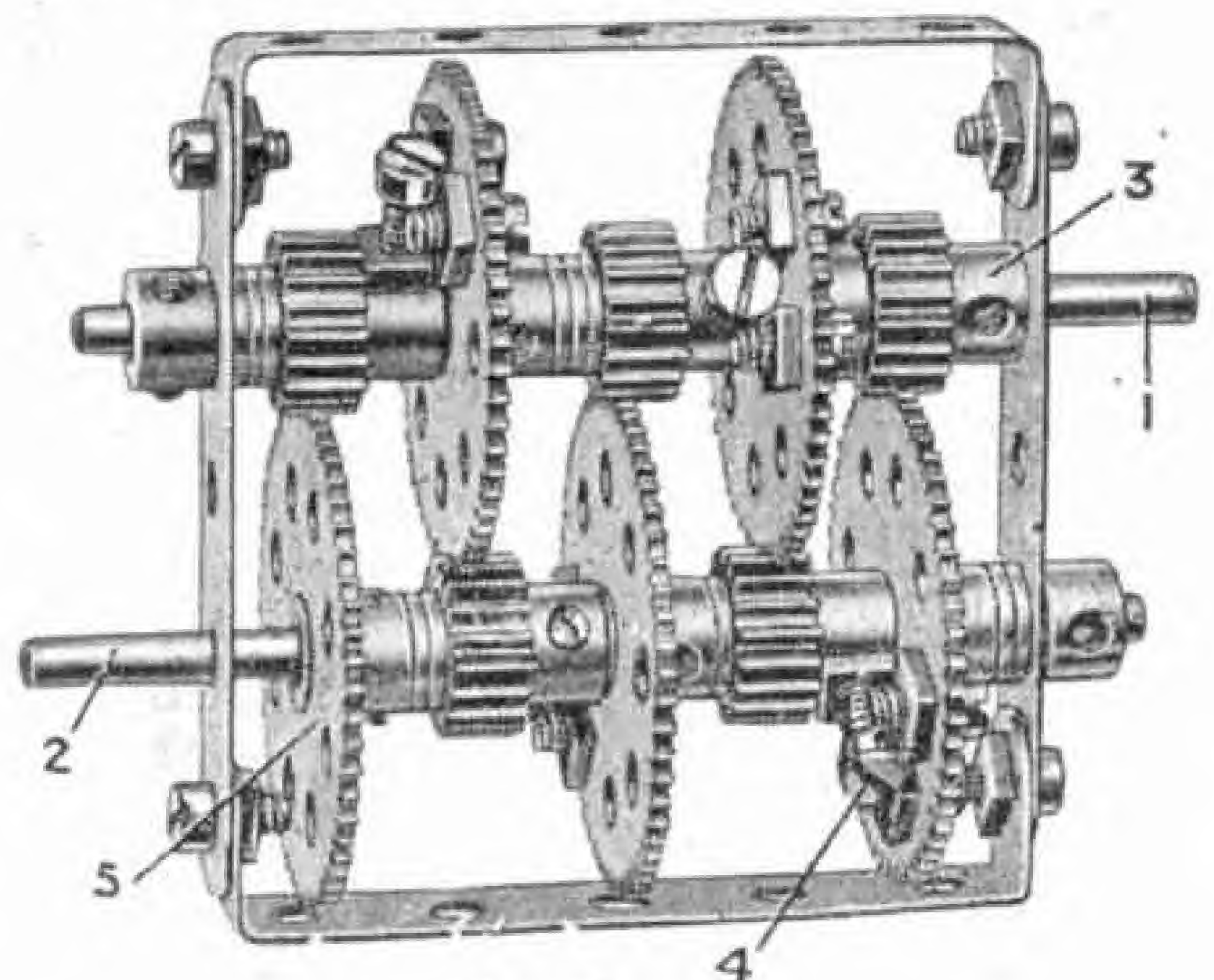


Fig. 582.

New Meccano Models

An Early Type Motor Car—Rowing Boat

EARLY types of machines and other mechanical devices provide splendid subjects for Meccano model-builders, and among the most interesting are the crude contraptions that formed the forerunners of the modern motor car. We have therefore chosen

back by $\frac{1}{2}$ " \times $\frac{1}{2}$ " Angle Brackets. They are also bolted to two $3\frac{1}{2}$ " Strips at their rear ends. The backs of the seats are formed from $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " and a $5\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate attached to the 3" Strips and fitted with $1\frac{1}{2}$ " Strips and 1" Corner Brackets.

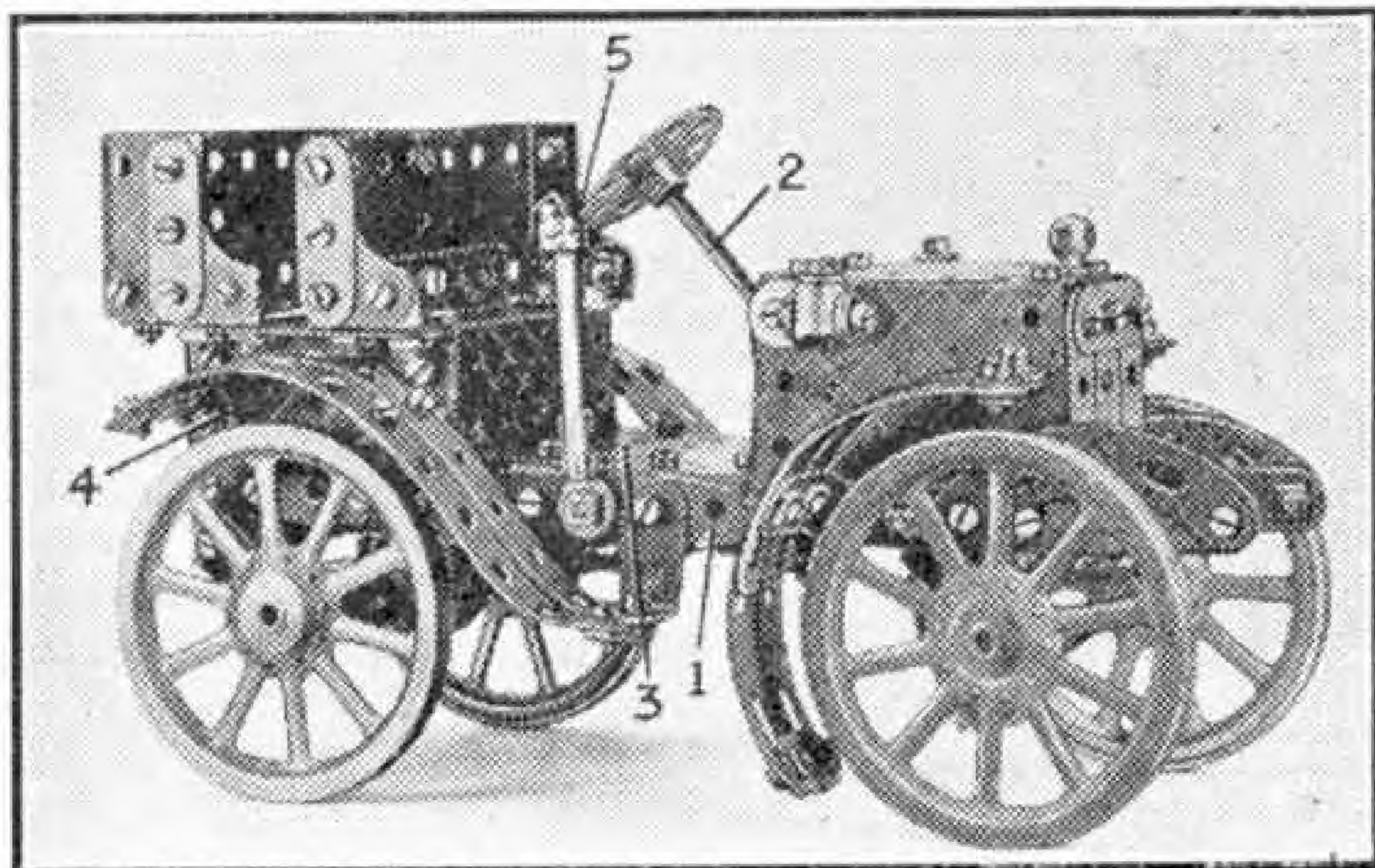


Fig. 1. An attractive model of an early motor car

one of these early vehicles for the subject of a "New Model," and it is shown reproduced in Meccano in Figs. 1 and 2.

Construction of the model is commenced with the forward end of the chassis. For this $7\frac{1}{2}$ " Strips 1, Fig. 1, are spaced apart at their forward ends by a $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip and attached by means of $\frac{1}{2}$ " \times $\frac{1}{2}$ " Angle Brackets to a $1\frac{1}{2}$ " Strip, to which three 2" Strips are bolted to form the radiator. Two $2\frac{1}{2}$ " Cranked Curved Strips and two $2\frac{1}{2}$ " Strips are bolted to Strips 1 at each side to form dummy springs for the front axle unit. A $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate is also bolted to each side, and this is fitted with a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate to form the top of the bonnet.

A $2\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip is fixed under the bonnet and is attached to a $1\frac{1}{2}$ " Angle Girder, the right-hand slotted hole of which provides a bearing for the steering column 2, a 4" Rod carrying a Bush Wheel at its upper end. The lower end of the steering column is journaled in a Handrail Support bolted to the side of the chassis, and it carries a Collar to which is bolted a Hinge. The Hinge is also attached to an Obtuse Angle Bracket bolted to a $2\frac{1}{2}$ " Strip that forms the track rod. The latter is pivotally attached at each end to Flat Brackets, which are secured to Angle Brackets and lock-nutted to a further $2\frac{1}{2}$ " Strip bolted to the $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip at the front of the chassis. Pivot Bolts inserted in these Angle Brackets carry Wheels forming the road wheels.

A $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate 3 is attached by $\frac{1}{2}$ " \times $\frac{1}{2}$ " Angle Brackets to the rear end of the Strips 1. The space between the front end of this Plate and a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate forming the back of the bonnet is filled in by another $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate, which is held in place by $\frac{1}{2}$ " \times $\frac{1}{2}$ " Angle Brackets.

The seats are now constructed and attached to the model as follows. A $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate 4, fitted at its front end with a 1" Corner Bracket, is attached at each side to the rear end of the Strip 1 and, at its front end, to a $2\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flexible Plate forming the front seat. The latter is widened at each side by 3" Strips, which are also attached to the Plates at each side and to a $2\frac{1}{2}$ " \times $1\frac{1}{2}$ " Flexible Plate at the

The rear axle is a $3\frac{1}{2}$ " Rod journaled in $2\frac{1}{2}$ " Cranked Curved Strips which are fitted to the chassis by 1" Corner Brackets. The Rod carries two Wheels, and also a 1" Pulley that is driven through a $2\frac{1}{2}$ " Driving Band from the Pulley of a Magic Motor bolted underneath the chassis in the position shown in Fig. 2. A brake is provided by a lever 5 Fig. 1, consisting of a 2" Rod inserted in a Rod and Strip Connector fixed on one end of a 3" Screwed Rod mounted in the Strips 1. Two Flat Brackets are secured on this Rod underneath the chassis, and are fitted with short lengths of Cord that are passed round $\frac{1}{2}$ " fixed Pulleys 6 on the axle. The Cords are fastened at their other ends to the sideplate of the Motor.

The model is completed by the addition of mudguards and headlamps, which are constructed as shown in our illustrations.

Parts required to build model Motor Car: 2 of No. 1b; 4 of No. 2; 2 of No. 3; 2 of No. 4; 4 of No. 5; 3 of No. 6;

6 of No. 6a; 1 of No. 9f; 12 of No. 10; 26 of No. 12; 2 of No. 12a; 4 of No. 12b; 1 of No. 12c; 1 of No. 15b; 1 of No. 16; 1 of No. 17; 4 of No. 19a; 1 of No. 22; 2 of No. 23a; 1 of No. 24; 140 of No. 37a; 130 of No. 37b; 28 of No. 38; 1 of No. 40; 1 of No. 48; 3 of No. 48a; 1 of No. 53; 3 of No. 59; 2 of No. 64; 1 of No. 80c; 4 of No. 90a; 3 of No. 111c; 1 of No. 114; 10 of No. 133a; 2 of No. 136; 2 of No. 147b; 1 of No. 186; 8 of No. 188; 1 of No. 189; 3 of No. 190; 1 of No. 212; 8 of No. 215; 1 Magic Motor.

Our second model this month is an amusing Meccano rowing boat, in which the oarsman actually carries out the movements of rowing. This is shown in Fig. 3,

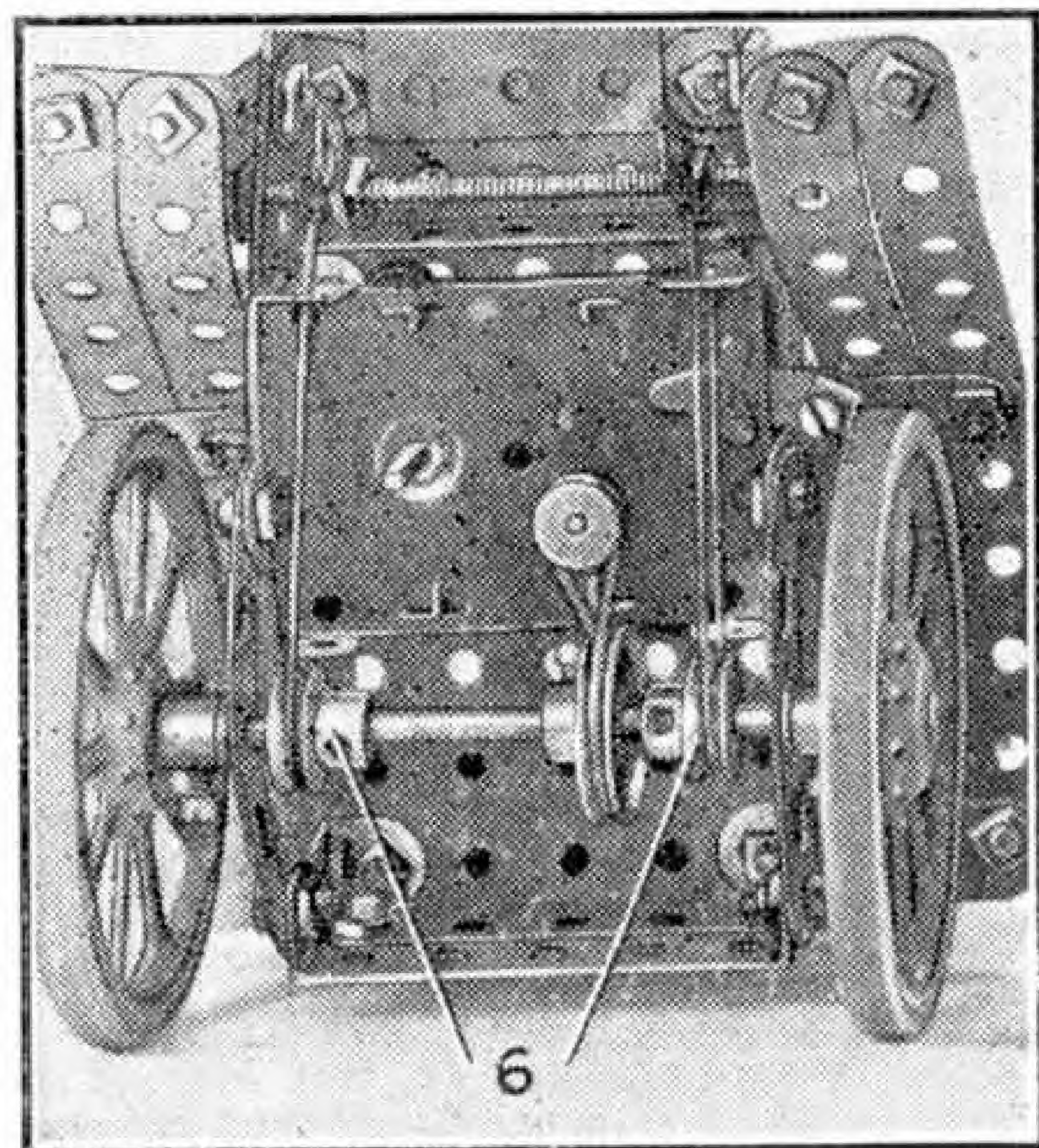


Fig. 2. Underneath view of motor car model.

and is designed for construction from Outfit No. 3.

The hull should first be built. Two $5\frac{1}{2}" \times 2\frac{1}{2}"$ and two $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates are bolted together and spaced at their rear ends by a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip 1. The lower edges of these Plates are bent inward and attached to two $12\frac{1}{2}"$ Strips 2 by $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets. The front ends of the Plates are attached to $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plates and $5\frac{1}{2}"$ Strips, and the bow is completed by bolting the latter Plates and Strips, together with the $12\frac{1}{2}"$ Strips 2, to a $2\frac{1}{2}"$ Cranked Curved Strip.

The stern and the rear seat are built up as a single unit by attaching a $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate, which is bent up at its forward end to form the back of the seat, to a similar Flexible Plate and a Semi-Circular Plate 3. The unit is secured, together with a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate forming the stern, to the $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip 1. Two 1" Pulleys 4 fitted with Rubber Rings are fixed in the front on a $1\frac{1}{2}"$ Rod journaled in the $12\frac{1}{2}"$ Strips 2. A third Pulley forms the rudder.

The rower and helmsman are now built up, and fitted in the boat. Each of these consists of a U-section Curved Plate bolted to a large radius Curved Plate and fitted by means of $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets to 3" Formed Slotted Strips forming the legs. The figures are also attached by these Angle Brackets to the seats, the oarsman's seat being provided by a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip bolted between the sideplates of the hull. Their heads and arms are now fitted, and the oars attached. The Bolt lock-nutting the right arm to the body of the oarsman has also on its shank a $3\frac{1}{2}"$ compound strip 5 formed from two $2\frac{1}{2}"$ Strips overlapped. This is lock-nutted at its lower end to a Bush Wheel 6 mounted on a 2" Rod journaled in the Plate at

the right side of the hull, which is strengthened by a Flat Bracket, and also in a Flat Trunnion bolted to one of the $12\frac{1}{2}"$ Strips 2. The Rod also carries a 1" Pulley 7 that is rotated from the axle of the forward travelling wheels by a $2\frac{1}{2}"$ Driving Band passed around it and the axle. When the model is pushed along the ground the body of the rower moves backward and forward, thus operating the oars realistically.

Parts required to build model Rowing Boat and

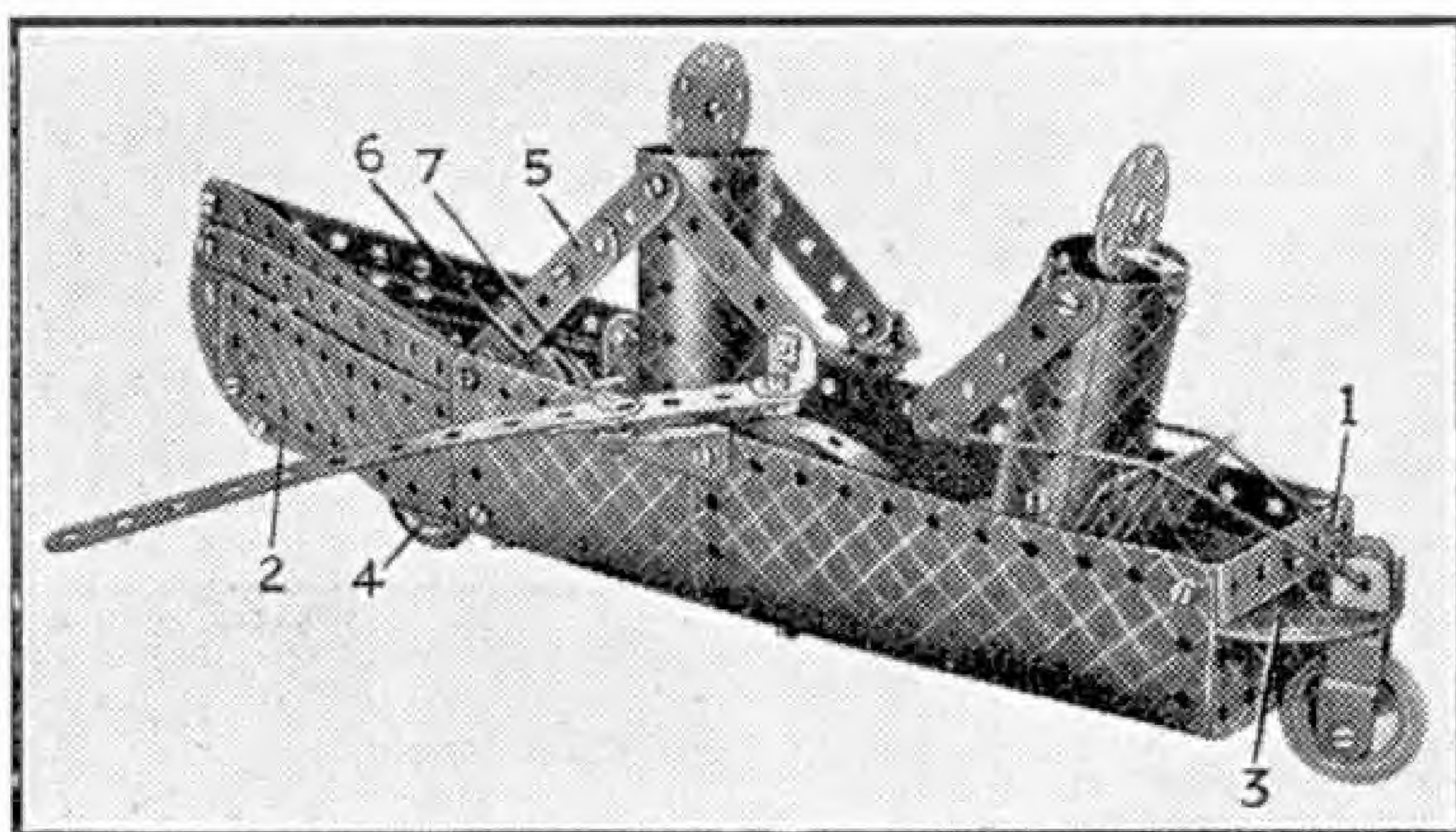


Fig. 3. The Meccano oarsman shows what he can do.

Crew: 2 of No. 1; 6 of No. 2; 7 of No. 5; 4 of No. 10; 2 of No. 11; 8 of No. 12; 1 of No. 17; 1 of No. 18a; 4 of No. 22; 1 of No. 24; 56 of No. 37a; 43 of No. 37b; 6 of No. 38; 1 of No. 40; 1 of No. 44; 2 of No. 48a; 2 of No. 90a; 5 of No. 111c; 2 of No. 125; 2 of No. 126; 1 of No. 126a; 3 of No. 155a; 1 of No. 186; 1 of No. 188; 2 of No. 189; 2 of No. 190; 2 of No. 191; 2 of No. 192; 2 of No. 199; 2 of No. 200; 1 of No. 214; 4 of No. 215; 2 of No. 217a.

Grand "New Year" Model-Building Contest

By "Spanner"

We are now in the busiest months of the model-building year, and this therefore is a fine opportunity for a great general model-building competition. With this in mind we are offering splendid prizes, in the form of cheques and postal orders, in a contest in which models of any size and type can be entered. Simple cranes built with small Outfits, giant locomotives constructed from the largest ones, bridges, motor vehicles and machines of all kinds are all eligible. Every model-builder should join in this grand contest, even if his Outfit is a small one and he is a beginner, for the judges will take these points into consideration in making their awards, and there is a special section for the younger model-builders. A group of models may be entered, but will be regarded as a single entry.

Preparing an entry for this contest is very easy. The model itself is not required, all that should be sent being a photograph or drawing, with any notes required to explain special constructional features.

On the back of each photograph or drawing sent in the competitor must write his name, address and age, and his entry should be forwarded to "New Year Model-Building Contest, Meccano Limited, Binns Road, Liverpool 13."

Entries will be divided into two sections according to the ages of competitors. Those from readers of 14 years of age or more will be placed in Section A, and those from competitors under 14 will be grouped together in Section B. The Contest will remain open for entries until 31st March.

The following prizes will be awarded in each Section of the Contest to the builders of the most interesting models received. First, Cheque for £2/2/-. Second and Third prizes will consist respectively of cheques for £1/1/- and 10/6. There will be also five further prizes, each consisting of a Postal Order for 5/-, and Certificates of Merit will be awarded to competitors whose models fall just short of prize-winning standard.



Club and Branch News



WITH THE SECRETARY

NEW YEAR GREETINGS

A happy and prosperous New Year to all Guild and H.R.C. members! This is our fourth wartime New Year, and I think it is the most cheerful that we have had, for recent events have stirred us considerably and at last we can begin to see a certainty of Victory within a reasonable time. I am sure that my readers will join with me in sending the season's greetings to all our members who are serving in the mighty forces now gathering for the great fight against aggression and tyranny.

Since September 1939 Clubs and Branches have experienced many changes. Some have met with trouble through enemy action, while others have been compelled by circumstances to cease holding meetings. Now that the tide is on the turn there are better prospects. The events of 1942 are a pointer in this respect. The outstanding features, particularly during the latter months of the year, have been the revival of many existing Clubs and Branches, and the formation of new ones. This increased activity speaks well for the enthusiasm and energy of members, and also for the value and interest of Club and Branch work. The advance must be kept going during 1943, and I want everybody concerned to do their utmost to stimulate interest, to improve the programmes and prospects of existing organisations, and to do their best to extend the influence of the Guild and H.R.C. everywhere.

MERIT MEDALLIONS FOR 1942

I am now making up the 1942 list of winners of Merit Medallions, for publication in the next issue of the "M.M." I want as many Clubs as possible to be represented in this list, and urge Leaders who have not yet sent in nominations to do so at once. In every active Club there must be members who have done good work of some kind, which should be recognised by this award, the highest available to Guild and Club members, and I shall look forward to receiving more names for excellent work during the past year. Nominations should reach me not later than 1st February.

Proposed Clubs

MOXLEY—Mr. W. Owen, 2, Foundry Street, Moxley, Nr. Wednesbury, Staffs.
GEORGEHAM—Mr. R. N. James, Justacott, Forda, Georgeham, Braunton, N. Devon.
STOCKPORT—Master P. Scott, 59, Roslyn Road, Adswood, Stockport.
HEREFORD—Mr. G. Scrivens, 50, Mill Street, Hereford.

KILROOT—Mr. M. C. Mulveagh, Dobbs Cottage, Kilroot, Carrickfergus, Co. Antrim.

Club Notes

TOTNES M.C.—"Nuts" and "Bolts" continue their friendly rivalry in model-building and games, which include Table-tennis and Monopoly. A Debate on the relative values of Commandos and Paratroops ended in a draw. New officials have been elected, and Club affairs generally are being conducted with keenness and efficiency. Club roll: 18. *Secretary*: P. Pascall, The Gables, Totnes.

CROSLAND LODGE (HUDDERSFIELD) M.C.—Meetings have been devoted chiefly to Model-building, and many excellent models have been constructed. The Aeroplane Spotting Section is doing good work and a Model Aeroplane Section has been formed. Tests have been arranged for "Spotters," and other forthcoming events include a spelling bee and model-building. Club roll: 9. *Secretary*: D. Graham, 19, Moorside Avenue, Crosland Moor, Huddersfield.



Section Leaders of the Exeter M.C., Leader, Mr. M. C. Hodder. On the left is J. Cory, Secretary, who is in charge of the Naval Section, and on the right J. Turner, who directs the work of the very successful Aircraft Section of the Club.

Branch News

WATERLOO (DUBLIN)—

Specials were run on the Branch representation of the Kent and East Sussex Railway in connection with the hop harvest. Improvements have been made on the layout, including the provision of crossing gates, and portions of the track will be relaid as soon as the necessary material can be obtained. A collection box has been installed in which members place money as they please, and the proceeds are used for various good purposes. *Secretary*: S. B. Carse, 38, Oakley Road, Ranelagh, Dublin.

BARNARD CASTLE SCHOOL—Officials have been elected, R. J. Churchill, formerly Secretary, now becoming Section Leader. A new track has been designed. This is screwed to the tables on which it is laid, and good scenery has been provided. Excellent running is enjoyed with five locomotives and a large selection of coaches and goods vehicles. Preparations are being made for an Exhibition. *Secretary*: A. Coates, Barnard Castle School, Barnard Castle, Co. Durham.

CLAPHAM COMMON—Great activity continues. The Branch Room has been put into good order and the track laid down. Track meetings also have been held. Monthly Film Shows continue and monthly Special Programmes, arranged by different officials in turn, have been introduced. *Secretary*: L. E. Mason, 215, Magdalen Road, Earlsfield, London S.W.18.

BEARSDEN (KESSINGTON)—The Branch Layout has now been completed and opened by Mr. A. Lamb, Chairman, in the presence of several visitors. Running operations are now in full swing. Signalling is installed, and station buildings are being constructed. *Secretary*: D. Reid, 5, Ormsay Crescent, Bearssden.



A train of Vans on the main line passing a shunting yard, where a coal train has just been made up.

Goods, Coal and Passengers in Dublo

PROBABLY one of the first things that the owner of even the simplest model railway outfit does is to make some attempt to carry some kind of freight in the open trucks on his line. As a rule at the start he picks on little odds and ends that are usually found in any household—little tins, small cartons, one or two blocks from a building set and so on. Then perhaps he begins to improve these gadgets with a touch of paint, or a few pencil lines, or by binding them up with thread or thin string. Quite realistic effects can be obtained in this way; a small round pill box becomes a cable drum, or a block of wood is transformed into a packing case.

General goods traffic is thus easily provided for, but sooner or later the idea of running a coal train presents itself. Here the Hornby-Dublo owner is fortunate, for the standard Coal Wagons D1 and D2 are already provided with a realistic load of coal; not real coal of course, but a good imitation. The running of coal trains is particularly topical at this time of the year and some really good fun can be had, even on a simple railway with only a siding or two, if we carry out the operations of collecting our trains together, sorting out the wagons into the required order, and then making a main line run and arranging for road vehicles to distribute our freight at the destination.

Operations are similar to those that we have described in the past for general freight traffic. We run our Hornby-Dublo Tank Locomotive from the shed and it first picks up a Brake Van, possibly from a nearby siding. It then makes off along the line and after a circuit or two of the track, according to the distance supposed to be run, it approaches a siding supposed to serve some particular colliery.

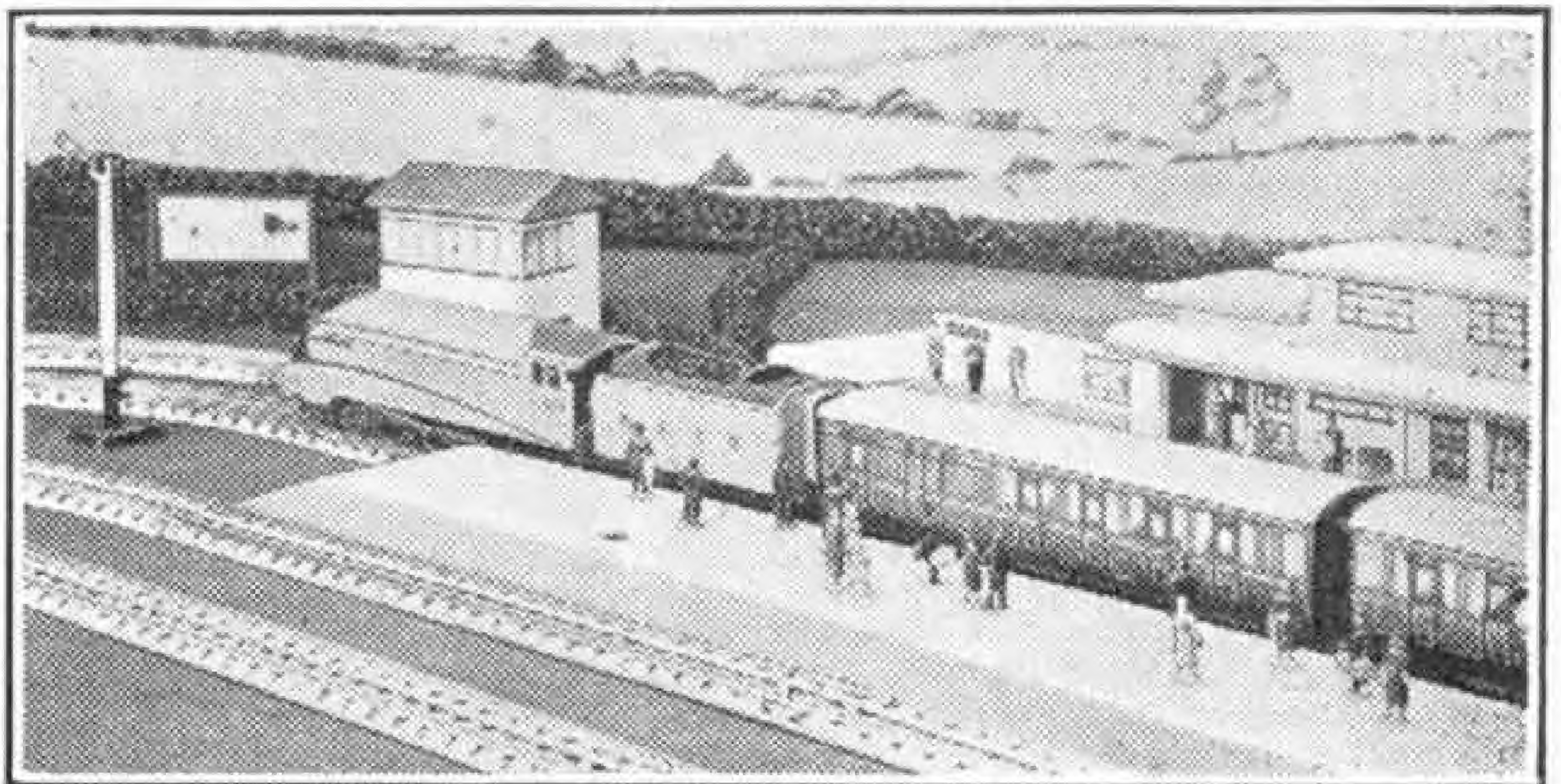
If the layout has only one siding, then successive calls will have to be made at the same place, the one siding representing a different colliery each time. When this is the case shunting operations can be arranged so that the wagons are in the required order when the train is complete. If the line boasts even a small yard of two or three roads, the vehicles can be run there and the re-making of the train carried out. Probably a few trucks will be supposed to be destined for intermediate

points, while others will be run right through. If so the wagons to be dropped off will be arranged behind the engine in the correct order, and the through vehicles will bring up the rear.

For the most part coal is carried in four-wheeled wagons of 12-tons or so capacity, and it is this type of vehicle that is represented by the Dublo Coal Wagon D1 and the High-Sided Coal Wagon D2. Some lines, however, employ high-capacity wagons to a certain extent, and these if fitted with automatic brakes are usually placed next to the engine, so that their braking power can be made use of to assist the engine to control the train which is otherwise unbraked except for the guard's van in the rear. Thus if we choose to press into service the High-Capacity Wagon D1, really intended for brick traffic, we should place it next to the locomotive.

For the main line run, if not too long, we can use the same 0-6-2 Tank, but it would be quite in order under the running conditions of to-day to use the 4-6-2 Streamlined Express Locomotive. On arrival at its destination our 4-6-2 can leave to the 0-6-2 Tank the work of placing the wagons conveniently for Dinky Toys Motor Vehicles to come alongside.

Although we may run our passenger trains on our Dublo railway, it is not possible to load up our Coaches with Miniature Figures. However, if our line is to appear to do any passenger business we must have some of these little "humans" on our Station platform, and round about the system we must have figures representing the staff for working the trains.

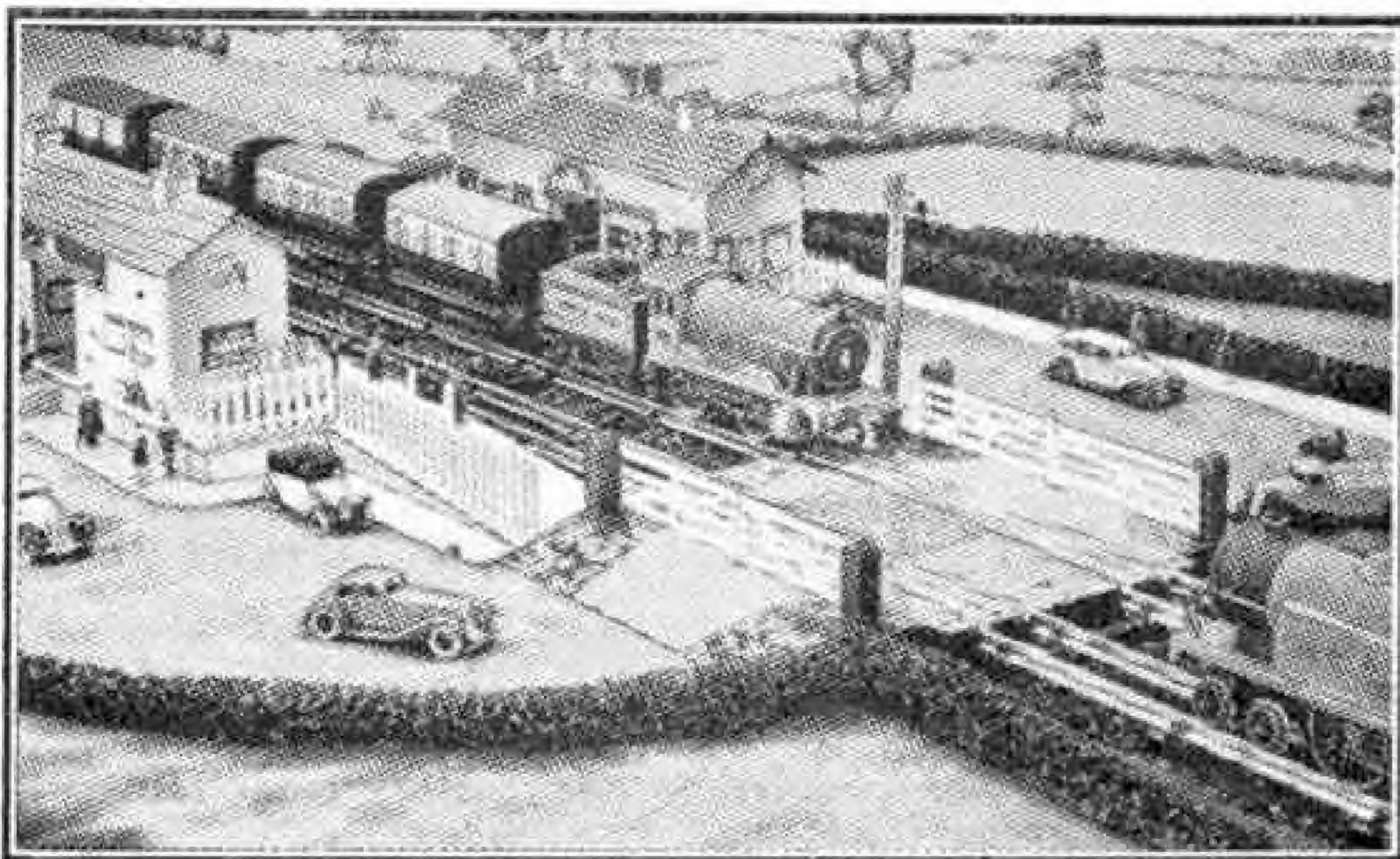


A realistic station scene in which the use of the Hornby-Dublo Miniature Figures is well shown.

Gauge 0 Local and Branch Trains

ON miniature railway systems most attention in operating is usually given to the important express trains. There is plenty of fun to be got from the working of secondary and suburban trains, however,

Here the single track splits into two loops. These unite again after passing through the platforms, and the track then leads to a turntable from which there radiate various tracks forming "Hatfield Loco." This



A Hornby "local" hauled by a No. 1 Special Locomotive. This is a typical mixed traffic engine of the kind referred to in this article.

especially if these are operated in an organised manner to represent some similar service of a real railway.

Operations of this kind are followed up on the L.N.E.R. layout of B. and P. Turk of East Barnet. These brothers have selected as the basis of their system the King's Cross to Hatfield line, together with the branch to St. Albans for which Hatfield is the junction station. They have the advantage of living in the area represented in miniature, so that they are able to observe the different workings and the practice generally of the dense traffic over the "Northern Heights" that is dealt with at King's Cross. Their scheme in general could be applied equally well to any similar service on other lines, however.

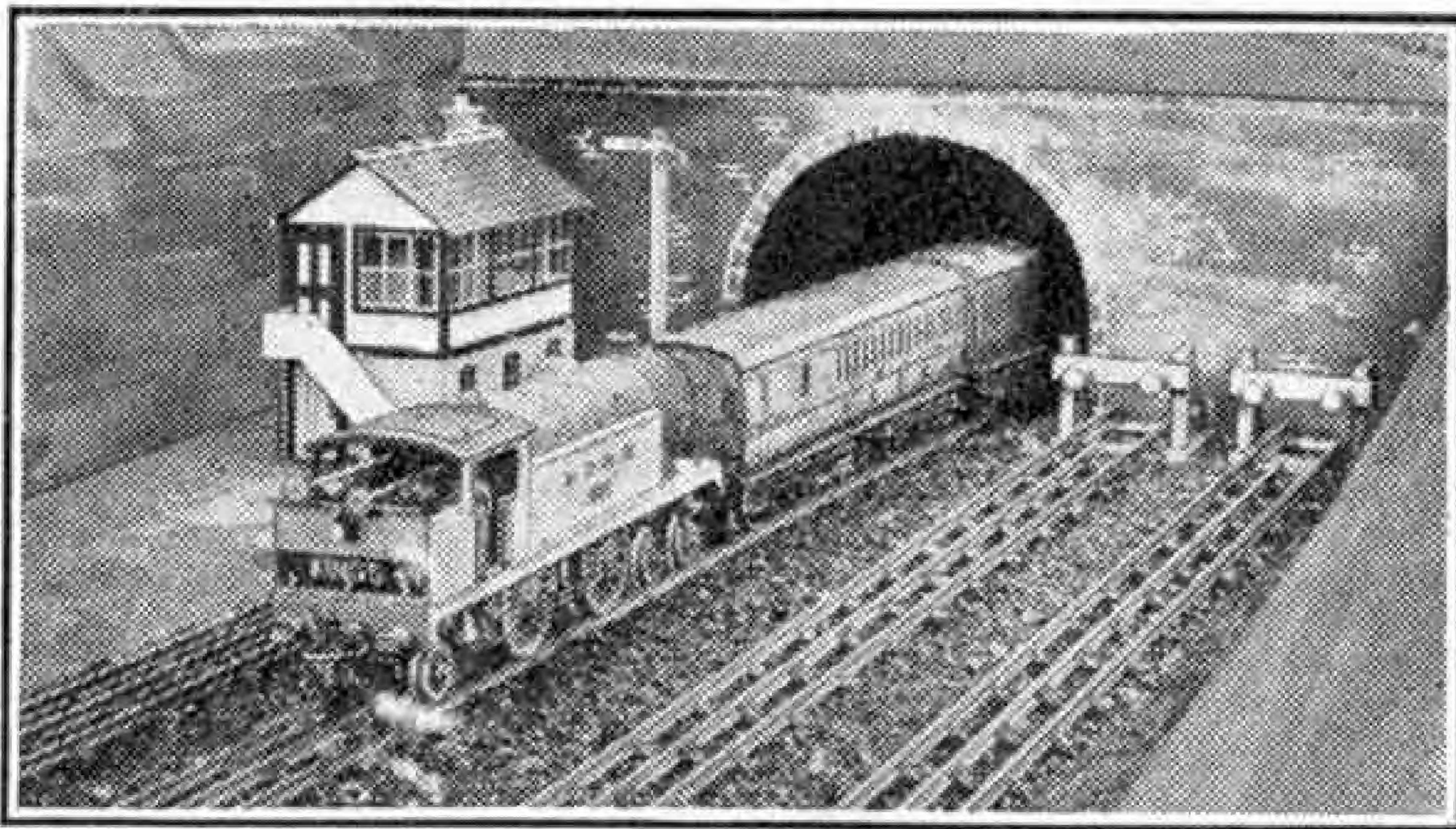
The miniature L.N.E.R. "Suburban Area" of course commences at "King's Cross," which is a three-road station having on one side a platform exclusively used for milk traffic. The tracks converge into single line soon after leaving the platforms, although the "milk lead" is extended outward to lead to a turntable and tracks that represent "King's Cross Locomotive Shed," and which also lead to storage lines known in miniature as "Holloway Sidings." The main track is concealed from these sidings as at this point it passes through a tunnel that stands for the familiar "Gasworks Tunnel" of real life. This end of the system thus represents in an interesting manner the main features of the exit from "King's Cross Suburban," except that the through line connecting the surface tracks by means of a steeply-rising gradient with the Metropolitan system underground is not modelled. This would have involved complications and has been very wisely left out; thus the traffic to and from Moorgate Street that is operated in real practice is not reproduced. Plenty of interesting running is however afforded by the stopping and semi-fast trains that are included in the working programme.

The first station out is "New Barnet," and from there with several curves the track reaches "Hatfield."

arrangement allows of the running of locomotives round their trains on arrival at "Hatfield" from either "King's Cross" or "St. Albans." The branch line to the latter station is taken off one of the loop tracks at "Hatfield" and it has also a connection from the goods yard. The branch line bears away from "Hatfield" "across country" and after passing over a girder bridge spanning a stream and traversing a fairly big curve it reaches the station supposed to serve the cathedral city. Here again the station arrangements include two loop lines through the platforms and an extension track allowing the storage of engines or rolling stock.

The main line is not extended beyond "Hatfield," as the chief interest is centred in the services between there and "King's Cross" or "St. Albans," and the transfer of traffic at the junction. The inclusion of the branch line draws one's attention away from the fact that the main line is left to make its way northward only in imagination. "St. Albans" marks the end of the branch line.

The working of the line includes features that can be applied generally to suburban and branch line operations on almost any system. Thus trains are frequently made up of No. 1 Passenger Coaches; these are ideal for suburban work and a set train of six of them as used on this railway gives a splendid representation of a "local." Alternatively the bogie No. 2 vehicles can be used either as a complete "Set," or else a combination of the bogie stock with a No. 1 Guards' Van is quite effective and saves space. One advantage of the use of No. 1 Coaches in one train



Bunker first to Town! A Hornby No. 2 Special Tank bearing a home-made destination board.

is that individual vehicles can be detached or added to the normal "rake" according to the variations of traffic. Both No. 1 and No. 2 Passenger Coaches have lamp brackets fitted so that the tail lamp can be displayed correctly and changed over from one end of the train to the other at the end of each journey.

Two of the smaller Hornby Tanks are used to represent the Gresley "N 2" class so familiar on local workings in and out of King's Cross, and there are also an M1/2 Locomotive and a No. 2 Special Tank.

Mr. Southwell's Gauge 0 Layout

The Latest Developments

MANY readers will remember the descriptions we have published in the past of the layout of Mr. J. Southwell of Northampton. As has been his custom in previous years, this enthusiastic miniature railway owner has recently submitted to us a complete report of the "season's" working on his line, and we are sure that readers will be interested in the following summary of the latest developments. The present layout, as with the original system laid down at Holyhead, is situated outside, although partly under cover, and the operating period began in April of last year and did not terminate until November. The track is kept well painted, and is completely taken up at the end of a "season" and reconditioned ready for the next.

The L.M.S. is the system represented, and the main route from Euston to Liverpool and Manchester is reproduced, together with a "Central Wales" section from Shrewsbury to Swansea, and the well-known Royal Mail Route along the North Wales Coast to Holyhead. All these were in use before the big developments that are now described. Not all the model stations are situated in the same geographical positions on the line relative to one another as are their real counterparts. This miniature railway "licence" was necessary partly because of space considerations and partly in view of the particular workings that were originally operative.

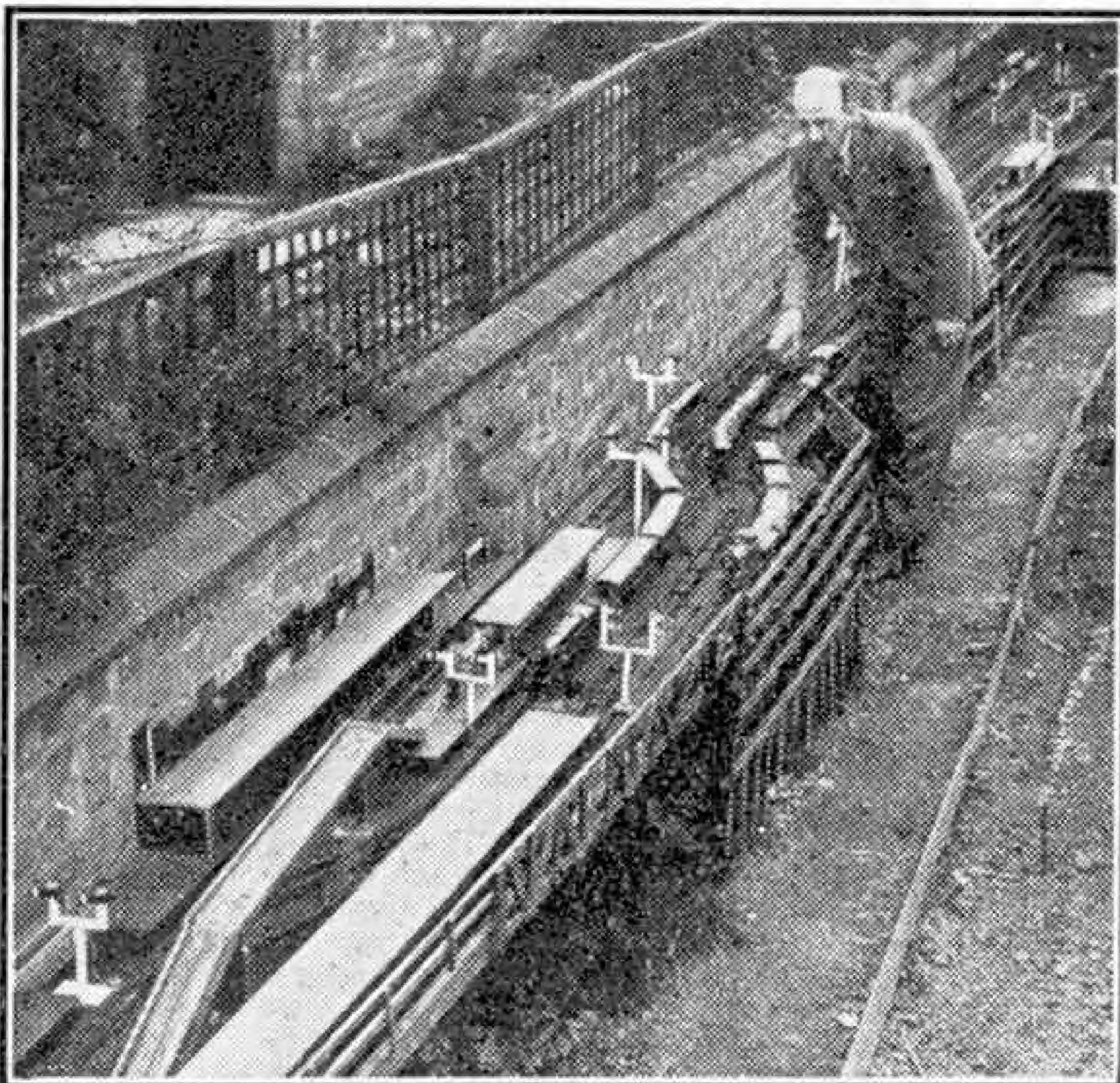
"Crewe" and "Stafford" have now been linked up by a direct line, and a new station called "Manchester (Exchange)" has been provided, having direct routes to the "Chester and North Wales" section and to "Crewe" and the South. An important extension has been the prolongation of the former "Crewe" and "Manchester (London Road)" route to "York," so that important connections can be made with North Eastern traffic. Two routes are now available from "Liverpool" to the South; via "Chester," and via "Warrington" and "Macclesfield." The two latter stations are completely new, and "Warrington" is an important focal point for both North and South traffic. A further introduction has been the building of a new station on the Holyhead route called "Bangor"; this forms a junction for a new branch line serving "Caernarvon."

That the amount of work involved was justified is shown by a perusal of the interesting "log book" recording all the workings carried out during the operating season. The original scheme of dividing the programme into "episodes" is still followed, and altogether 108 of these were run through during the 70 or so actual working days on which the system was in operation. Both "summer" and "winter" workings were run off, and it is also the practice to have special or modified services representing the August peak traffic period operations and Christmas day services respectively. Night and early morning mail services are well represented, and the Holyhead Mails are specially concentrated on. Mr. Southwell includes in his programme also all the sailings of cargo and mail steamers to and from the miniature Holyhead Harbour that are required to connect with the different

trains. These include also the sailings required to work the boats "home" for the winter laying-up period.

In going through the various episodes it is quite thrilling to read the details of the working, and one gets the same "journey sense" as when following up real services in an actual timetable. The entry "*Through Express Holyhead to London (Euston)*" incidentally conjures up a vision of the real "*Irish Mail*." At times these trains are run in two separate parts, and a second boat is used as a relief for the extra traffic. "Cross Country" and branch connections are not neglected, and important freight workings too are included in the programme. The great point about these episodes is that all connections are made and the secondary services are actually run, through coaches are exchanged, and the whole work is carried on just as in real life.

That the engines and rolling stock, most of them of Hornby manufacture, have to work very hard is



"Chester" station and approaches showing operations in progress on the miniature L.M.S. system of Mr. J. Southwell, Northampton, who is seen in the illustration. Reproduction by courtesy of the "Northampton Independent."

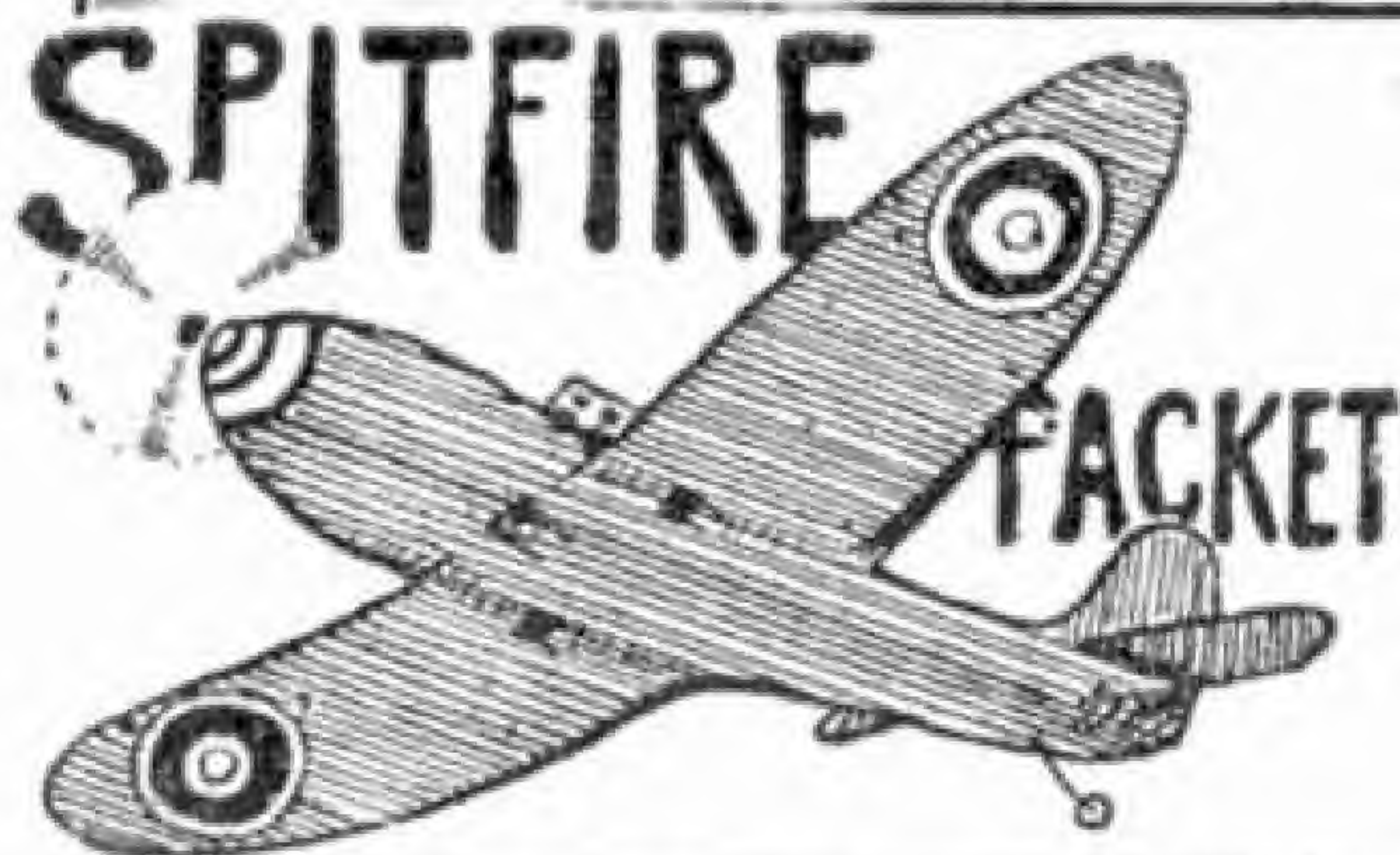
obvious. At the same time it is clear that they are very well maintained, and the power of the clockwork locomotives is found to improve as the season progresses. A load of 12 No. 1 Coaches behind the tender of a "Royal Scot" is not unknown for the run between "Euston" and "Chester." To cope with the additional traffic new stock has been unobtainable, but some serviceable material has been purchased second-hand, and other stock constructed at home. There are now 40 passenger coaches in use and 10 locomotives, and the line serves 17 stations. The stations have all been made at home to suit the particular requirements of the site, and they have to stand the weather.

Further developments on this remarkable system will be awaited with interest.

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For other Stamp Advertisements see pages 32 and v.

Stamp Collecting

Explorers and Navigators on Stamps

LAST month we dealt with stamps celebrating the romantic voyages of Columbus. This month we can take still further the story of the era that he began, for events in the discovery of the New World are depicted in stamps of many American countries, and these could well be included in a special collection illustrating exploration by sea.

One of the greatest of New World navigators was John Cabot, the Bristol merchant, of Italian origin, who discovered Newfoundland and was the first European to sight the American continent itself.

Cabot thought that by sailing on a more northerly course than that of Columbus it would be possible to reach Japan, then known as Cipango and reputed to be fabulously wealthy, and when on his first voyage he found land, on 24th June 1497, he thought that he had been successful. Later he discovered that he was mistaken. He had actually reached Newfoundland, and on a second voyage he sighted the North American continent, along the shore of which he coasted as far south as Florida.

As we should expect, this famous explorer figures on the stamps of Newfoundland. One of a series issued in 1897 bears a portrait of Cabot, and others show his landing place and his ship leaving the Avon. Another has on it a portrait of Henry VII, who encouraged his schemes and rewarded him with a grant of £10 for the discovery of a New World!

Another great explorer whose deeds have been celebrated by the issue of stamps is Balboa, the discoverer of the Pacific Ocean. After various adventures Balboa reached Darien, on the Atlantic shore of the Isthmus of Panama, and while there, heard stories of a great ocean and rich countries to the west. He set out to find these, and on 26th September 1513 he reached the summit of the mountains of the Isthmus, and saw the great Pacific stretched out before him.

Balboa's reward for his discoveries was an unjust execution in 1517. Panama has celebrated his exploits by a portrait on stamps issued in 1906 and 1909, and by special stamps, appearing in 1913 and 1915 respectively, showing the explorer viewing the Pacific Ocean for the first time and reaching its shores. The portrait stamps also were issued in the Panama Canal zone, under the control of the United States, in this case with the words "Canal Zone" overprinted, and one of these stamps is reproduced here. A direct tribute from the United States consists of a portrait stamp that was one of a series issued in 1912 to commemorate the opening of the Panama Canal.

The story of exploration by sea in the modern world began before Columbus, and it is interesting to find that the impulse was given by a Portuguese

prince who was half English. This was Prince Henry the Navigator, whose mother was an English princess. He earned his distinctive title by his encouragement of sailors and the improvements in navigation that he instigated by founding a special school for its study. He made no great voyages himself, but his captains sailed out into the Atlantic, where they discovered the Azores and other islands, and along the African coast, one of them eventually rounding the Cape of Good Hope.

His great work has been recognised by a special set of stamps issued in his native country in 1894, and Angola, a Portuguese colony on the west coast of Africa, included a portrait in a special series issued as recently as 1938.

One of the greatest of all navigators was Vasco da Gama, whose portrait also appears in the 1938 Portuguese Angola series. After the Cape of Good Hope had been rounded it was realised that here lay a new sea route to India and the Spice Islands of the East, and Vasco da Gama was chosen to command a fleet that set out in 1497 to explore the way. His men suffered many great hardships, but da Gama overcame storms, mutiny and other difficulties, and finally reached India after a voyage of 10 months. He deserves to rank with Columbus, for in his pioneer voyage and others that followed he opened up the East to European trade as Columbus had opened up the West. His story too is told in stamps, notably in a special series

issue of 1898 in Portugal, 400 years after he began his first voyage. One of these shows the explorer's fleet setting out, and is reproduced on this page. Other stamps in the series show various incidents, including the arrival at Calicut, in India. The same stamps were issued in the Azores and elsewhere in Portuguese dominions with various surcharges, and portraits appeared on stamps of various colonies. Of these we reproduce a fine triangular portrait stamp issued in 1924 in Portuguese Nyassa. There were two values, 20 c. and 50 c., both postage due stamps.

Columbus sailed to the West and Vasco da Gama to the East. They were followed by another great explorer and navigator, Ferdinand Magellan, whose little fleet completed the work of his predecessors by sailing right round the world. Magellan himself was killed in a skirmish in the East Indies, and only one of his ships limped home to Spain, with 17 survivors of the original crews. We reproduce on page 33 a stamp showing Magellan's landing in the Philippine Islands, which became a Spanish possession. It is a United States issue for the islands, which they have controlled since the Spanish-American war of 1898.

To these stamps we can add many others, such as those of Peru that feature Pizarro, and French examples celebrating navigators such as Cartier, who founded French Canada in the 16th century.

(Cont. on page 33)



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This very interesting and historical issue should be in every collection. It will increase the value and interest of any collection and YOU can get this stamp from us ABSOLUTELY FREE by asking to see one of our Approval Selections. Also you must send us 3d. in stamps to cover cost of our postages. Only one of these Gifts can be sent free to each applicant.

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Stamp Gossip and Notes on New Issues

Another "V" Stamp

The fashion for issuing Victory stamps has now spread to Costa Rica, where a handsome carmine 5 c. value with the Victory "V" as its principal feature has just appeared. The "V" is superimposed on a waving Costa Rican flag, below which are the flags of the United Nations, and the design is completed by a shining torch, presumably the torch of Victory.

The Germans have tried to turn the now famous



sign to good use on their own account, and the postmark illustrated on this page is an example of the appropriations they have made. The stamp is a Norwegian one, and the postmark, applied recently in Norway, shows the same sign as that appearing on the Costa Rica stamp, and on others that have been previously mentioned in these notes.

Free French Issues

This month we illustrate two of the recent series of definitive stamps issued in French colonies that acknowledge Gen. de Gaulle as their leader. It will be remembered that air stamps from these colonies were described and illustrated last month.

For each colony there are 14 stamps, in five distinctive designs, one for each. One of the designs illustrated is that for St. Pierre and Miquelon, the French islands off Newfoundland; the choice of a ship for the principal feature is appropriate in view of the fact that the people of the colony live chiefly by fishing. The other design reproduced is that for the Oceanic Settlements, and shows a tipairua, or ocean-going native canoe. This is about 70 ft. long, and its masts are carved with figures of gods.

Of the four designs not illustrated here, that for French Equatorial Africa shows a phoenix rising from the flames, symbolic of French revival after the collapse of 1940. A typical oriental design with lotus flowers comes from French possessions in India, and from the French Cameroons comes an austere stamp, featuring the Cross of Lorraine, sword and shield, framed by vertical bands in geometrical design.

The New Caledonian stamp shows a kagu, a bird found only in that part of the world. It is grey in colour and short-legged, and it has a reputation for courage and the capacity to triumph over its enemies when this is least expected.

Each of the six issues makes a special feature of the Cross



of Lorraine and the initials R.F., so long characteristic of stamps of the French Republic. The words "France Libre" also are prominently displayed in each case. An interesting point is that the stamps were designed by Edmond Dulac, the famous artist and book illustrator.

Stamps of corresponding values are printed in the same colours in these very attractive issues.

Explorers in Stamps—(Continued from page 31)

and Charcot, a French Arctic and Antarctic explorer. Among the stamps of New Caledonia, a French colony in the Pacific, there is one portraying La Perouse, a great French navigator of the 18th century whose ships, with all on board, disappeared mysteriously in the Pacific in 1788, and de Bougainville, the first Frenchman to sail round the world. The most famous of later explorers by sea however was Captain Cook. This remarkable man, who began life as a shop boy in a Yorkshire village, became one of the greatest

seamen and navigators of all times, and surveyed a greater length of new coast line than any other explorer. He added Australia and New Zealand to the



British Empire, and explored the Pacific Ocean from the Arctic in the North to the Antarctic in the South.

For stamps illustrating Captain Cook's achievements we turn naturally to countries in and around the

Pacific. Foremost among them is the set issued in New Zealand in 1940 to commemorate the centenary of British rule there. One of the stamps, the 1d. value shown on page 31, gives a portrait of Captain Cook himself, with a picture of his famous ship "Endeavour" and a copy of his chart of New Zealand, made in 1769. Cook was not the actual discoverer of New Zealand. The Dutch explorer Tasman had seen the country more than 100

years previously, but Cook was the first to land and to survey the islands. Other explorers too had stumbled across Australia before him, but he explored its eastern coast thoroughly, and was the first to realise that the land was hospitable and suitable for settlement. It is not surprising therefore to find his portrait on a stamp issue in New South Wales, the 4d. value in a series of 1888. Other stamps featuring the great navigator come from Pacific islands, notably Rarotonga, also known as the Cook Islands. There is a fine portrait of him on the 1½d. value of a series issued in 1920. Another portrait appears on the 1d. value of an issue of 1932, reproduced here, and the ½d. value in the same issue illustrates his landing on the islands, with the "Endeavour" standing off shore. A similar set comes from Atutaki, which is under the control of New Zealand.

BOOKS TO READ

THE RAILWAY HANDBOOK 1942-43

(Railway Publishing Company Ltd. Price 4/-)

That most useful railway reference book known as *"The Railway Handbook"* has just appeared for 1942-43. Generally it follows the editions of previous years in being a mine of statistical information on practically all aspects of railway work. As far as has been possible under present conditions all tables have been brought up to date. For the most part the information given relates to the railways of Great Britain and Ireland, but the railways of the world are considered in the section dealing with the electrification of steam lines.

Apart from the figures relating to such matters as train speeds, highest altitudes attained on various lines, longest tunnels and so on, there are numerous sections of explanatory matter covering a great many railway subjects and including brief sketches of the development of each of the main railway systems. Reference is made easier by the arrangement of statistical matter next to the particular details to which it is related. Several new items or chapters have been introduced, notably those dealing with the Government control of railways, and with the centralised wagon control system adopted during the present emergency to ensure an adequate supply of wagons. There is, as usual, a chronology of British railway history, which is both useful and interesting. The index makes for ready reference and it is claimed that the information covered cannot be obtained in any other single publication at the same price.

"BUILD YOUR OWN ENLARGER"

By A. C. STEVENSON (Fountain Press. 7/6)

The photographic enthusiast soon sees the advantages of making large prints from small negatives, or from portions of large ones, and for those who wish to take up this branch of photography the author has described six enlargers of various types that can be constructed by anyone capable of using a very few simple tools. General principles are first dealt with, after which the building of a standard base-board and upright is explained. The enlargers that follow cover a wide range, giving the reader an excellent choice of types to cover his special needs, and in each there is a detailed specification, with ample drawings to make every detail of the construction clear. Useful information on condensers, lenses and exposure times complete an excellent practical book.

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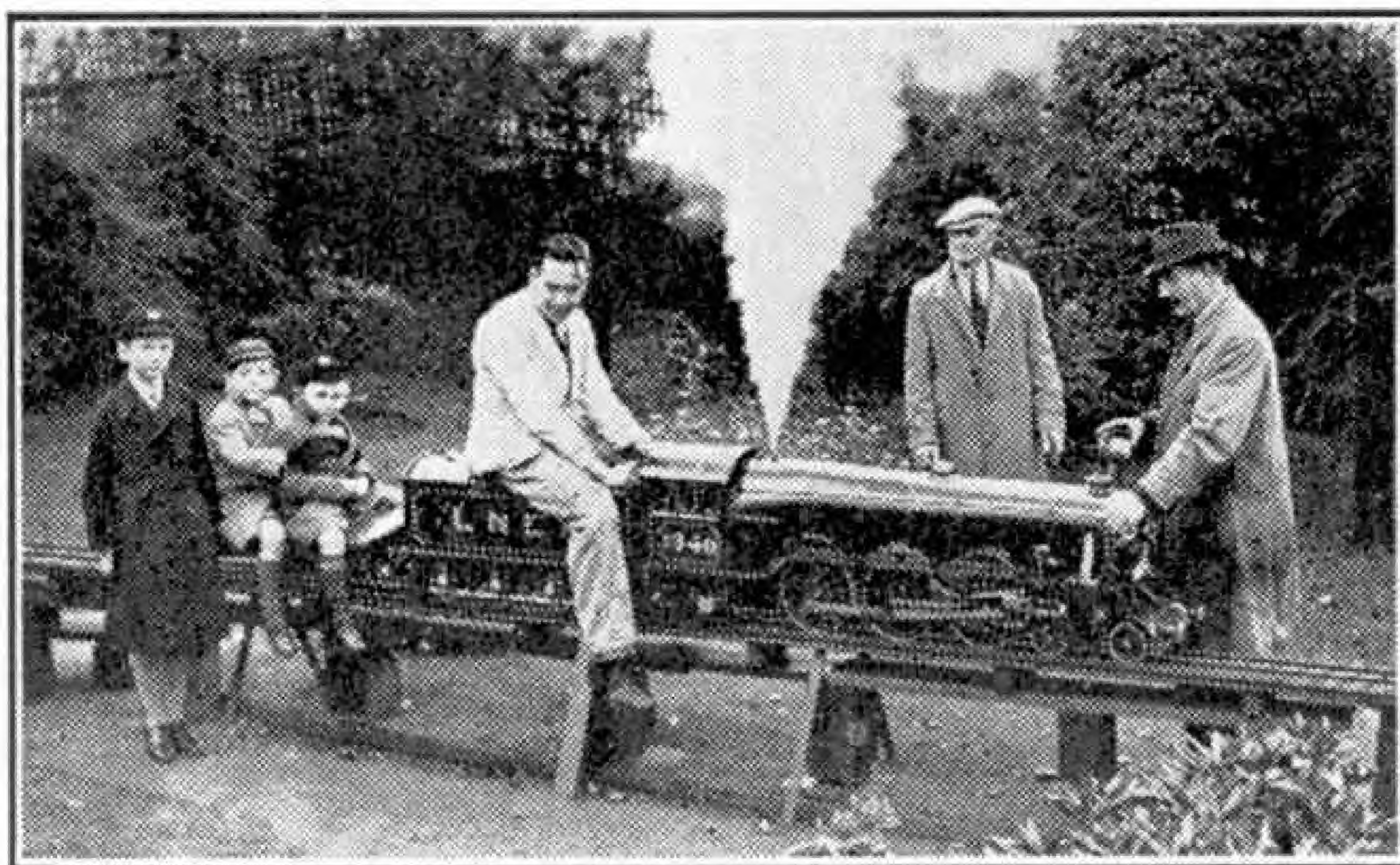
The author gives us a good start by telling us about the seven wonders of the ancient world, linking them as far as possible with the later progress of invention. Then he turns his attention to modern science in

a series of chapters that are simply packed with information. He begins with the astronomer, showing how he has developed his telescopes and other instruments in order to search space to the uttermost, and showing at the same time how practical use has been made of the knowledge he has won in navigation at sea and in the air. Then he deals in turn with the triumphs of the chemist, the agriculturist and the doctor, gives us an insight into the work of the physicist and of engineers on sea, land and in the air, and finally tells us about the greatest of modern wonders, radio and television. The book contains 10 illustrations.

"HOW MAN BECAME A GIANT"

By M. ILIN and E. SEGAL (Routledge. 7/6 net)

Man is not a giant in size, but he has the strength of a giant, and the authors have set out in this book



"Right Away!" A 7½ in. gauge working model of an L.N.E.R. "Pacific" is driven on the track by Mr. O. Dove. This model was built by Mr. E. Dove, Sherwood, Nottingham, who is seen on the right. It has been on display in various parts of the country and has been instrumental in raising £4,000 on behalf of War Charities. Photograph by courtesy of the "Nottingham Journal."

to show how he succeeded in making himself master of a world full of bigger and stronger living things than himself. This he has done by using his brains, and with the authors we follow his development from the time when he freed himself from the forests and lived in caves, watch the gradual development of his mastery, and even realise how he learned to speak and so to communicate his thoughts to other men. The story is a fascinating one, and here is told simply but well. There are eight illustrations.

Is Seeing Believing—(Continued from page 15)

two larger circles seem to roll round the inner one independently. The effect of this illusion is increased by drawing the circles in different colours, using say red and blue for the two larger ones and yellow for the small one.

When we stare fixedly at some near object, say a page of print, our vision is liable to become blurred and even double. This is an interesting type of illusion that can be given a decidedly humorous turn. Fig. 7 (page 15) provides an instance. The rider and his bicycle appear to have parted company, but at the top of the figure is a cross, and if the page is brought near the eye and the gaze is concentrated on the cross, the rider will appear to move forward to occupy his usual seat. It is indeed easy to overdo things, with the result that the cyclist actually appears to get ahead of his mount!

Competitions! Open To All Readers



Which Were the Most Popular Covers in 1942?

The covers of the "M.M." are deservedly famous. Readers generally take great pride in them, and welcome the opportunity we give them in January of each year of looking back over the covers of the previous year and telling us which they like best. Here is our 1942 Cover Voting Contest. The 12 covers concerned are reproduced in miniature above as guides to competitors, who will not need to be reminded that these in no way reproduce the colour and brilliance of the originals.

All that is necessary in this contest is that each entrant shall state on a postcard: A, the cover that he likes best; and B, what he thinks will be the order of popularity as decided by the votes of com-

petitors. The covers must be referred to by the names of the months in which they appeared, and it is not necessary that a competitor's own favourite should be at the head of list B, which should represent his idea of general opinion.

The names and addresses of entrants must be written on their postcards, which should be addressed to "1942 Cover Voting Contest, Meccano Magazine, Binns Road, Liverpool 13." There will be separate sections for Home and Overseas readers, with prizes in each of 21/-, 10/6 and 5/-, respectively, for the best entries, and consolation prizes will be awarded for other good efforts. Closing dates: Home Section, 30th January; Overseas Section, 31st May.

A "Locomotive Pie"

This month we have a competition of a type that has always been very popular with the railway enthusiasts among our readers, and indeed will be found attractive by others, most of whom are familiar with locomotive names and numbers from their reading of the "Meccano Magazine." The competition is an easy one and will give them a splendid chance of making good use of railway knowledge in general.

Below is a selection of letters and figures, and from these competitors are asked to build up as many British locomotive names and numbers as possible. Both number and name must be given in each case.

A A B D E G H H I I K L L M N O O
P R R S S T U Y
0 0 1 1 2 2 4 5 6 6 7 8 9 9

The following examples will make the position clear. L.N.E.R. No. 2582 "Sir Hugo" can be included in the solution, as all the figures and letters required appear in the list; L.M.S. No. 5653 "Barham" cannot be included, for the number of this locomotive includes two "5's" and only one is contained in the list. Although no letter or figure can be included in any one name and number more often than it appears in our list, it is not necessary to use every letter and figure, or to make use of any one as often as it appears in the list; only those required should be selected.

Entries should be addressed "January Locomotive Pie Contest, Meccano Magazine, Binns Road, Liverpool

13." There will be two sections in this contest, for Home and Overseas readers respectively, and in each prizes of 21/-, 10/6 and 5/- will be awarded in order of merit, together with consolation prizes. Neatness and novelty will be taken into consideration if there is a tie for any prize. Competitors should remember to put their names and addresses on each sheet of their entries. The closing dates are as follows: Home Section, 30th January; Overseas Section, 31st May.

January Photographic Contest

Here is the first of our 1943 series of photographic contests, in which prizes are offered for the best photographs of any kind submitted. There are two conditions—1, that the photographs must have been taken by the competitor; and 2, that on the back of each print must be stated exactly what the photograph represents. A fancy title may be added if desired. We remind readers that they must not photograph any features of military importance.

Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16. They should be addressed "January Photo. Contest, Meccano Magazine, Binns Road, Liverpool 13." There will be separate sections for Overseas readers.

In each section prizes of 15/- and 7/6 will be awarded, together with consolation prizes for other good efforts. Closing dates: Home Section, 30th January; Overseas Section, 31st May.

Fireside Fun

"Yes, mum," said the tramp. "There are dangers everywhere on the road. You could say I carry my life in my hands."

"So that's why your hands are dirty! Afraid of drowning yourself, I suppose."



"Don't rub me, mum. Just blot me."

Teacher: "When the barometer falls, what does that tell us?"

Tommy: "Nail's come out of the wall, miss."

Mrs. Jones: "How's your husband, Mrs. Smith?"

Mrs. Smith: "Oh, fine. He's coming home now on embrocation leave."

"How do you explain your late return from leave?"

"Missed my train, sir."

"H'm. But you are three days overdue. Did you miss the train by three days?"

A soldier in the Middle East was being worried by a guide, who had followed him for hours in spite of being ignored.

"Look here," he said at length in exasperation. "If you don't stop following me I will give you a punch on the nose."

"You give me punch," said the guide happily, "and then I show you sights for three shillings."

"Have you anything to relieve pain," asked the sorrowful small boy in the chemist's shop.

"Certainly," was the reply. "Where is the pain?"

"I haven't got it yet, but father is reading my school report now."

"What does your father do for a living, sonny?"

"He chops down trees, sir."

"And what does he do after chopping them down?"

"He chops them up."



Housewife: "Don't bring me any more of that horrid milk. It's positively blue."

Milkboy: "It's not our fault. It's these long dark evenings that makes the cows depressed."

BRAIN TEASERS

A LONG WAY FOR A FISH

Bill Smith, a Canadian, travelled 768 miles to reach a place where he could enjoy a day's sea fishing. He caught one cod, and on the return journey he travelled four-fifths as many miles by water as by road and five-twelfths as many by motor car as by water. How many miles did he travel in each manner?

* * *

SPOT THE STARS

$\frac{f^{**}/^{**}/^{*}}{3}$ is $\frac{f^{*}/5/^{*}}{5}$. Can you fill in the missing figures represented by asterisks? It will help you to know that each of the figures from one to nine is represented once. (T.K.C.).

* * *

WHICH JUMPED FIRST?

Three bandits were hiding in the mountains when a distant enemy scout fired on them. One only heard the shot, and another only saw the smoke. The third neither saw nor heard anything until the bullet struck the rock behind which he was hiding. Which of the bandits first knew of their danger? (T.K.C.).

* * *



"That's a wartime cake, John. What do you think of it?"

"Fine, Martha. Keep the recipe carefully. You've got the answer to the rubber shortage."

* * *

SOLUTIONS TO LAST MONTH'S PUZZLES

The best way to solve brain teasers of the type of our first last month is to imagine one train to be standing, adding its speed to that of the other or subtracting it, according to whether the trains are approaching each other or running in the same direction. This gives the same relative speeds, on which the answers depend. In this instance, with the trains moving in opposite directions the relative speed is 105 m.p.h. or 154 ft. per second. The combined trains therefore have a length of 462 ft., so that the "local" is 154 ft. long and the passenger express 308 ft. long. If the two were travelling in the same direction the relative speed would be 15 m.p.h., or 22 ft. per second, so that 462 divided by 22, or 21 sec. would be required for the two to pass completely.

Our second puzzle was a trick. The answer is none, for whoever heard of a monkey that could say anything?

Those who waded through the tangles of our twisty third problem would find the time to be 6.43, or 17 min. to 7.

* * *

THIS MONTH'S HOWLER

Algebra is arithmetic with letters instead of figures. It is the best and quickest way of working out an answer because you can't see how it is done.

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(Continued from pages 30 and 32)

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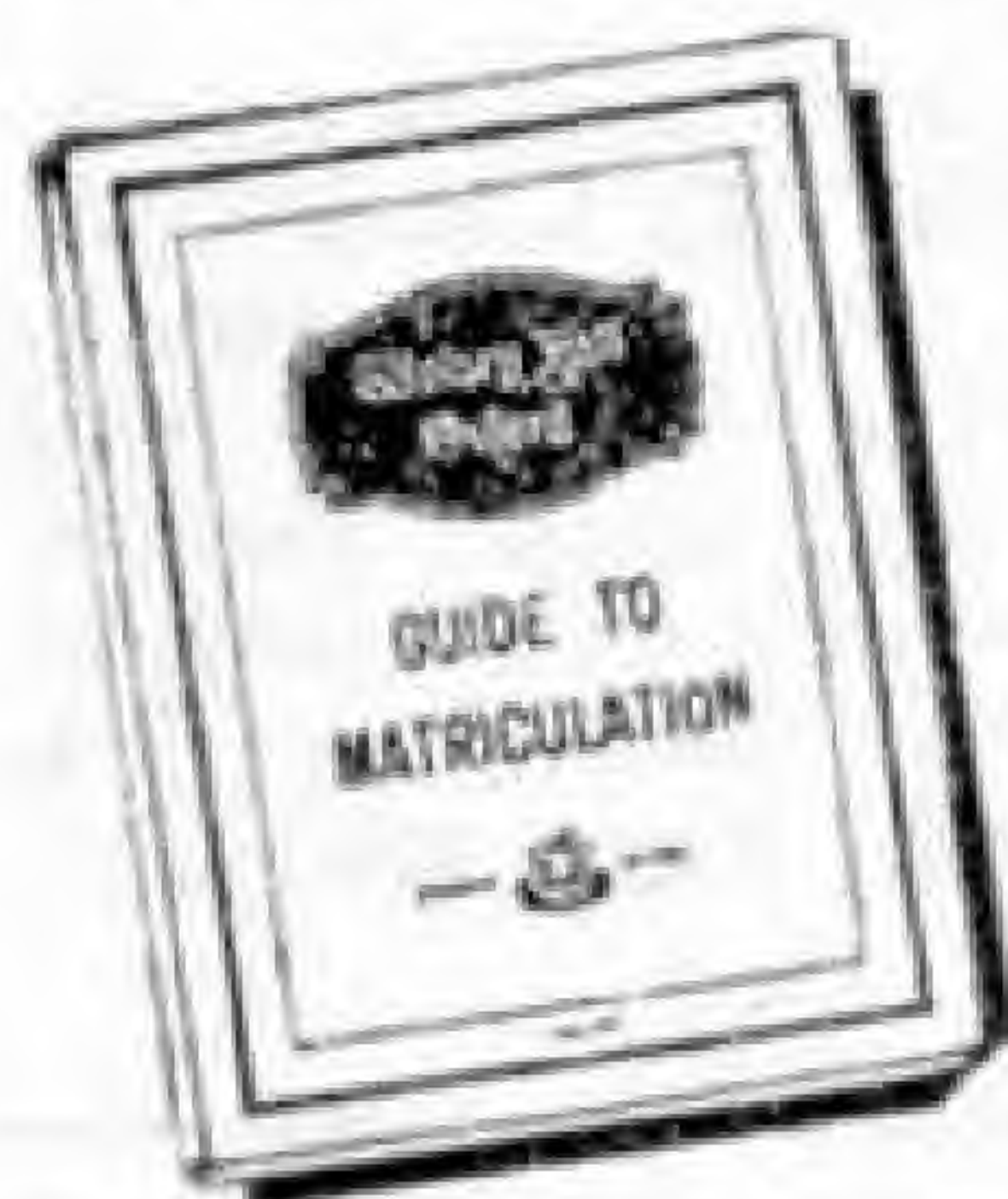
Thousands of these sets were sold to readers and their friends last winter. If you missed them, here is another chance. Although in sets, nearly all the stamps are priced separately, mostly from 1d. to 5d. About 6 sets sent each time with many other stamps that are sure to appeal. Discount is given and postage is paid each way. A postcard will bring the best approvals you have ever seen.

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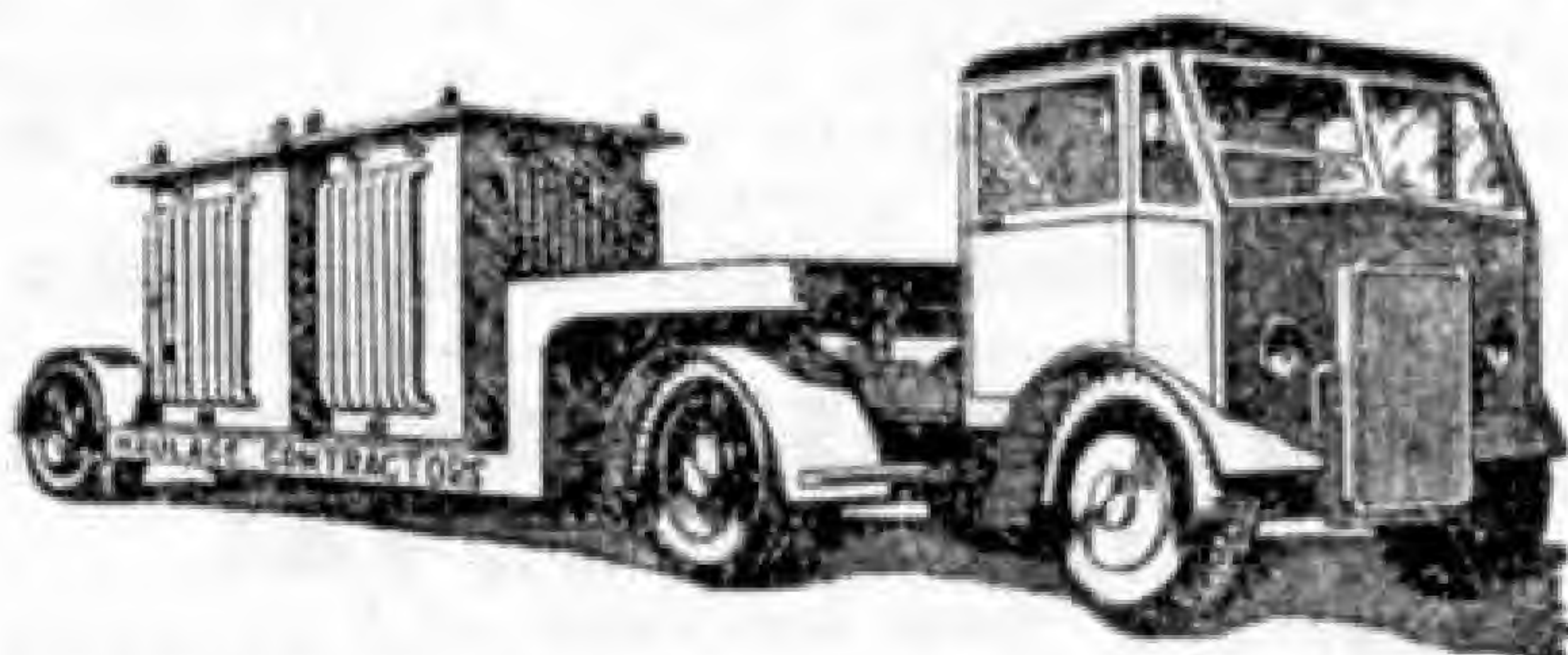
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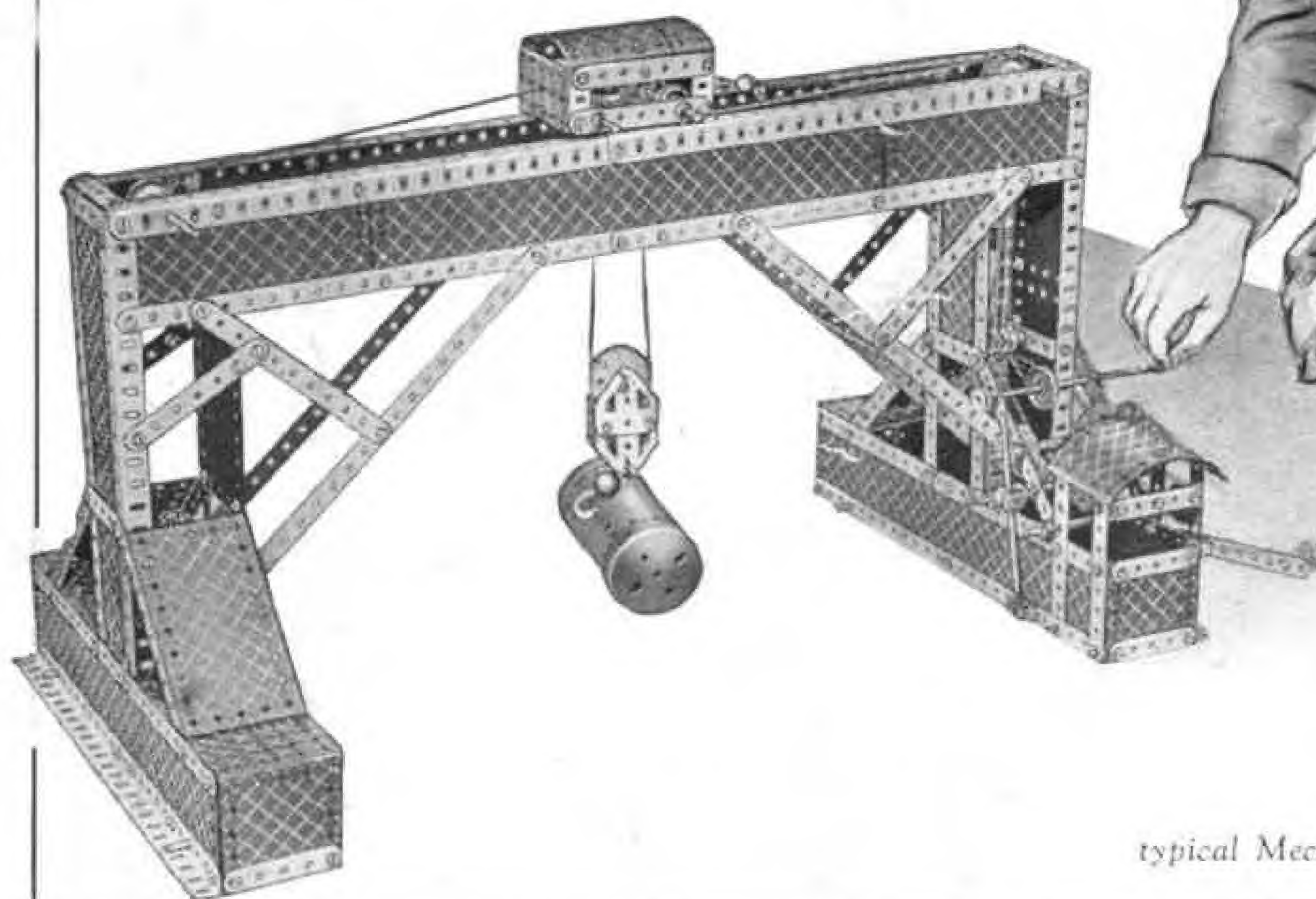
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